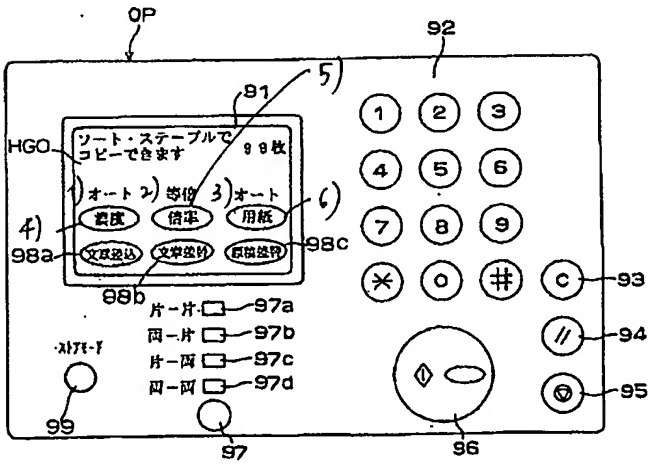
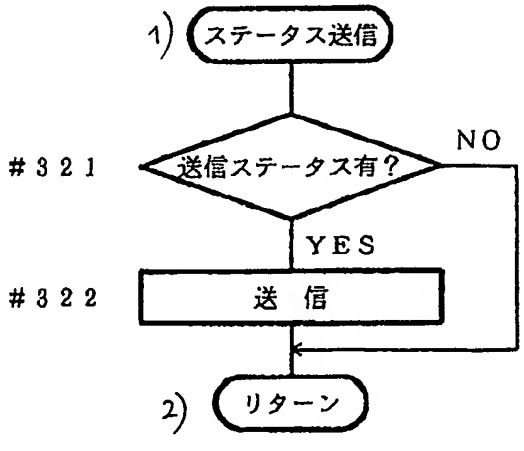
示す図である。
【図２０】メモリモード読出し動作の動作シーケンスを示す図である。
【図２１】ＣＰＵ１０１のメインルーチンのフローチャートである。
【図２２】ＣＰＵ１０２のメインルーチンのフローチャートである。
【図２３】ＣＰＵ１０３のメインルーチンのフローチャートである。
【図２４】ＣＰＵ１０４のメインルーチンのフローチャートである。
【図２５】ＣＰＵ１０５のメインルーチンのフローチャートである。
【図２６】ＣＰＵ１０６のメインルーチンのフローチャートである。
【図２７】ＣＰＵ１０７のメインルーチンのフローチャートである。
【図２８】ＣＰＵ１０８のメインルーチンのフローチャートである。
【図２９】入力制御処理のフローチャートである。
【図３０】モード／コマンド設定処理のフローチャートである。
【図３１】文章差込処理のフローチャートである。
【図３２】文章差替処理のフローチャートである。
【図３３】原稿差替処理のフローチャートである。
【図３４】ストア処理のフローチャートである。
【図３５】コマンド受信処理のフローチャートである。
【図３６】ステータス送信処理のフローチャートである。
【図３７】画像メモリ書込み制御処理のフローチャートである。
【図３８】圧縮制御処理のフローチャートである。
【図３９】伸長制御処理のフローチャートである。
【図４０】画像メモリ読出し制御処理のフローチャートである。
【図４１】消去処理のフローチャートである。
【図４２】登録処理のフローチャートである。
【符号の説明】
１　複写機（画像形成装置）
９８ａ　文章差込ボタン（記憶原稿選択手段、原稿順序指定手段）
９８ａ３　前文章ボタン（記憶原稿選択手段）
９８ａ４　次文章ボタン（記憶原稿選択手段）
９８ａ５　前頁ボタン（記憶原稿選択手段）
９８ａ６　次頁ボタン（記憶原稿選択手段）
９８ａ１０　頁変更ボタン（原稿順序指定手段）
９８ａ１１　頁変更ボタン（原稿順序指定手段）
９８ｂ　文章差替ボタン（記憶原稿選択手段、原稿順序指定手段）
９８ｂ３　前文章ボタン（記憶原稿選択手段）
９８ｂ４　次文章ボタン（記憶原稿選択手段）
９８ｂ１０　カーソルボタン（記憶原稿選択手段、原稿順序指定手段）
９８ｂ１１　カーソルボタン（記憶原稿選択手段、原稿順序指定手段）
１００　制御部（記憶原稿選択手段、原稿順序指定手段、出力切換え手段、原稿差替手段）
３０１　画像切換え部（出力切換え手段）
３０４　画像メモリ（画像記憶部）
３０６　符号メモリ（画像記憶部）
ＩＲ　読取り装置（画像読取り部）
ＰＲＴ　プリンタ装置（プリンタ部）
ＨＧ２　画面（差込モード表示画面）
ＨＧ４、ＨＧ５　画面（差替モード表示画面）

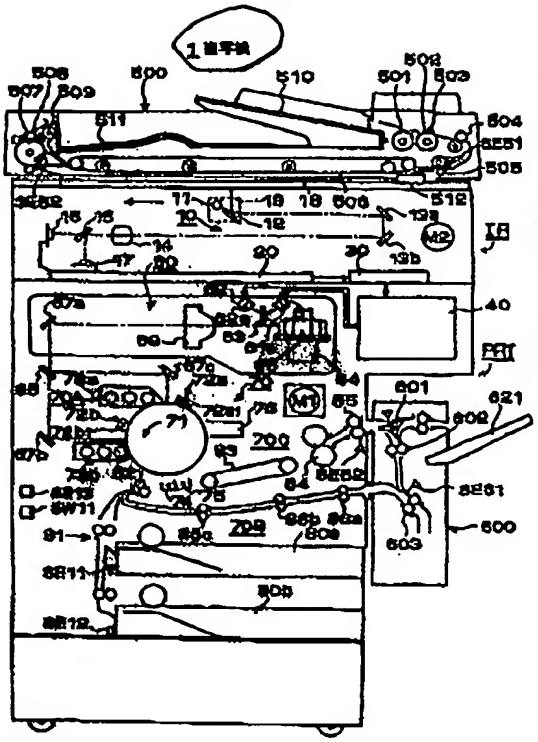
【図２】



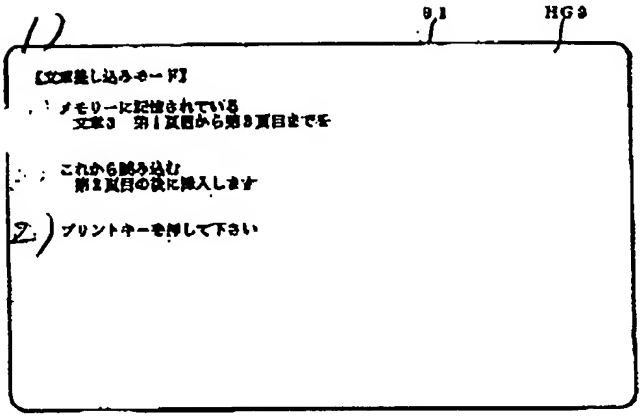
【図３６】



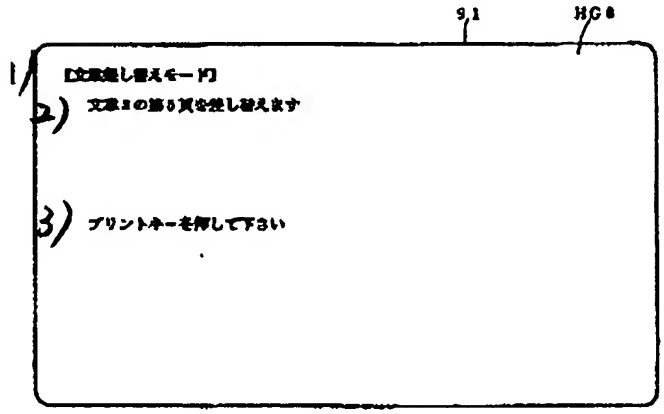
【図１】



【図４】

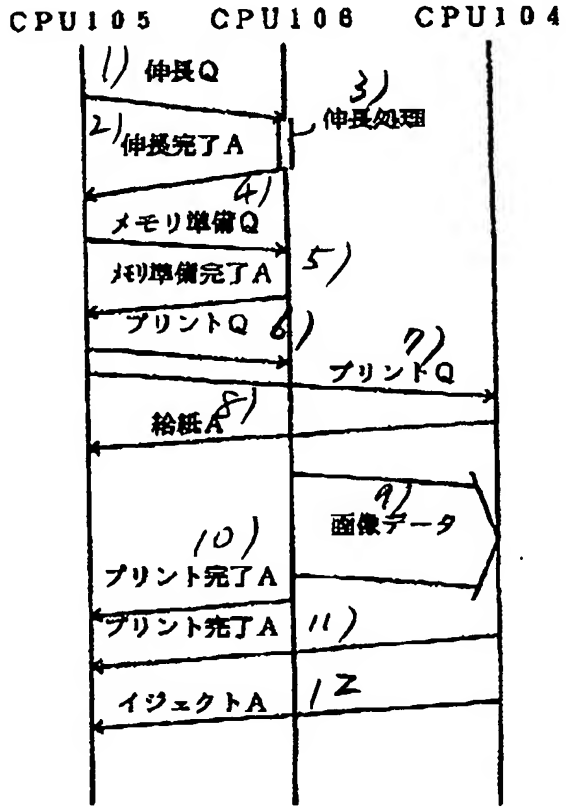


【図６】

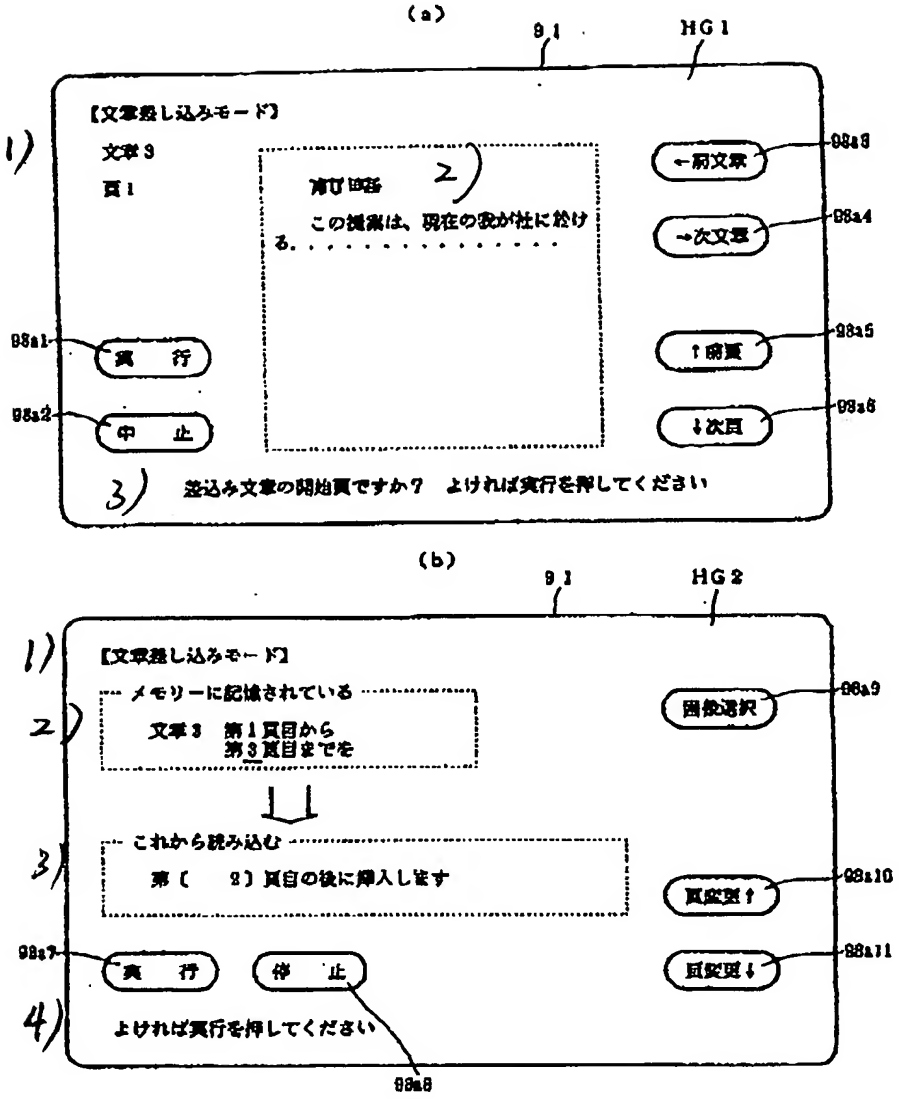


【図２０】

メモリモード読出し動作

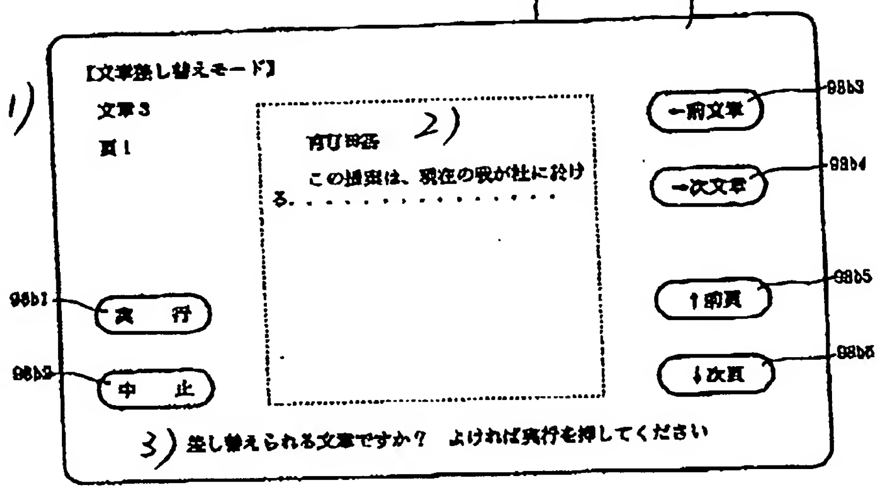


【図３】

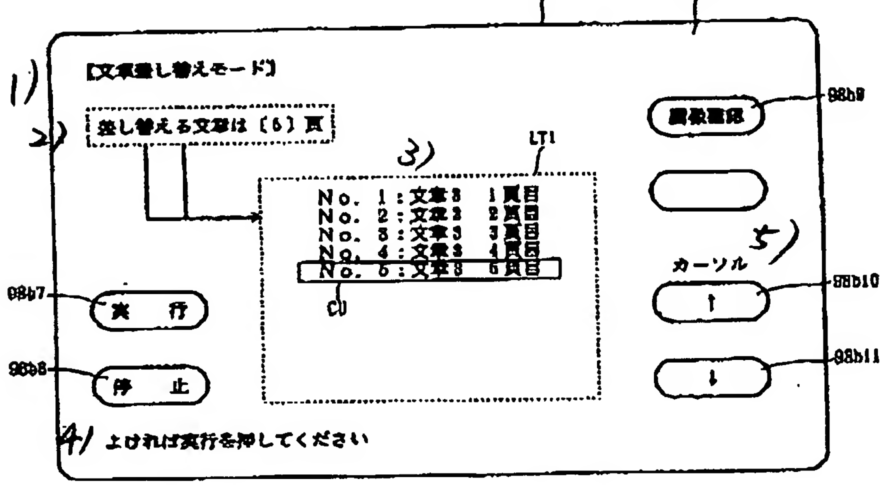

(a)
91
HG1
【文章差し込みモード】
1)
文章3
頁1
2)
この提案は、現在の我が社に於ける。
←前文章
98a3
→次文章
98a4
98a1
実　行
98a2
中　止
↑前頁
98a5
↓次頁
98a6
3)
差込み文章の開始頁ですか？　よければ実行を押してください
(b)
91
HG2
1)
【文章差し込みモード】
2)
メモリーに記憶されている
文章3　第1頁目から
第3頁目までを
画像選択
98a9
3)
これから読み込む
第（　2）頁目の後に挿入します
頁変更↑
98a10
98a7
実　行
停　止
頁変更↓
98a11
4)
よければ実行を押してください
98a8

【図5】

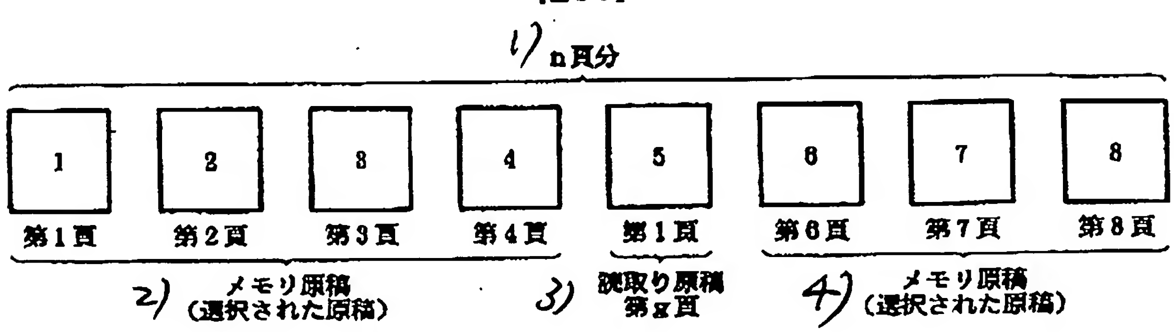
(a)


9,1
HG 4
【文章差し替えモード】
文章3
頁1
この提案は、現在の我が社に於ける。. . . . .
←前文章
→次文章
↑前頁
↓次頁
98b1
98b2
98b3
98b4
98b5
98b6
実 行
中 止
差し替えられる文章ですか？ よければ実行を押してください

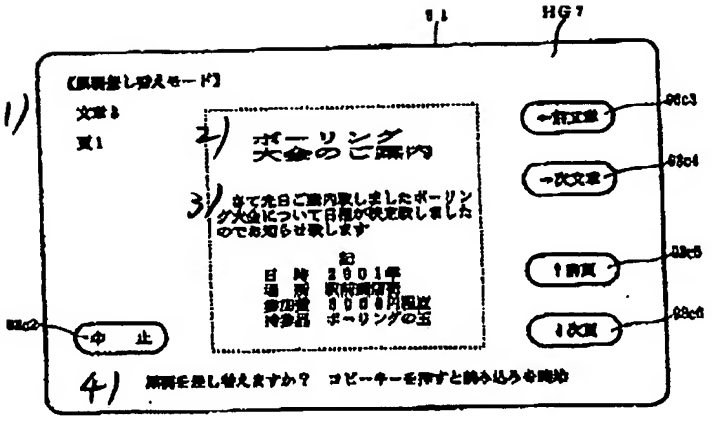
(b)


9,1
HG 5
【文章差し替えモード】
差し替える文章は〔5〕頁
LT1
No. 1：文章3 1頁目
No. 2：文章3 2頁目
No. 3：文章3 3頁目
No. 4：文章3 4頁目
No. 5：文章3 5頁目
CU
カーソル
98b7
98b8
98b9
98b10
98b11
実 行
停 止
よければ実行を押してください

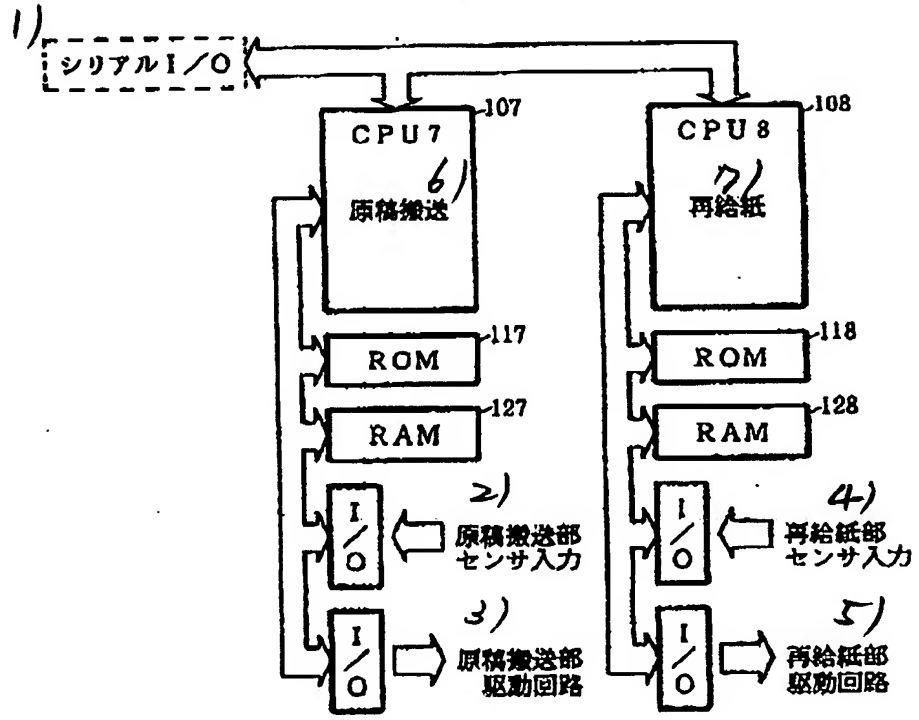
【図16】


n頁分
1
2
3
4
5
6
7
8
第1頁
第2頁
第3頁
第4頁
第1頁
第6頁
第7頁
第8頁
メモリ原稿
(選択された原稿)
読取り原稿
第x頁
メモリ原稿
(選択された原稿)

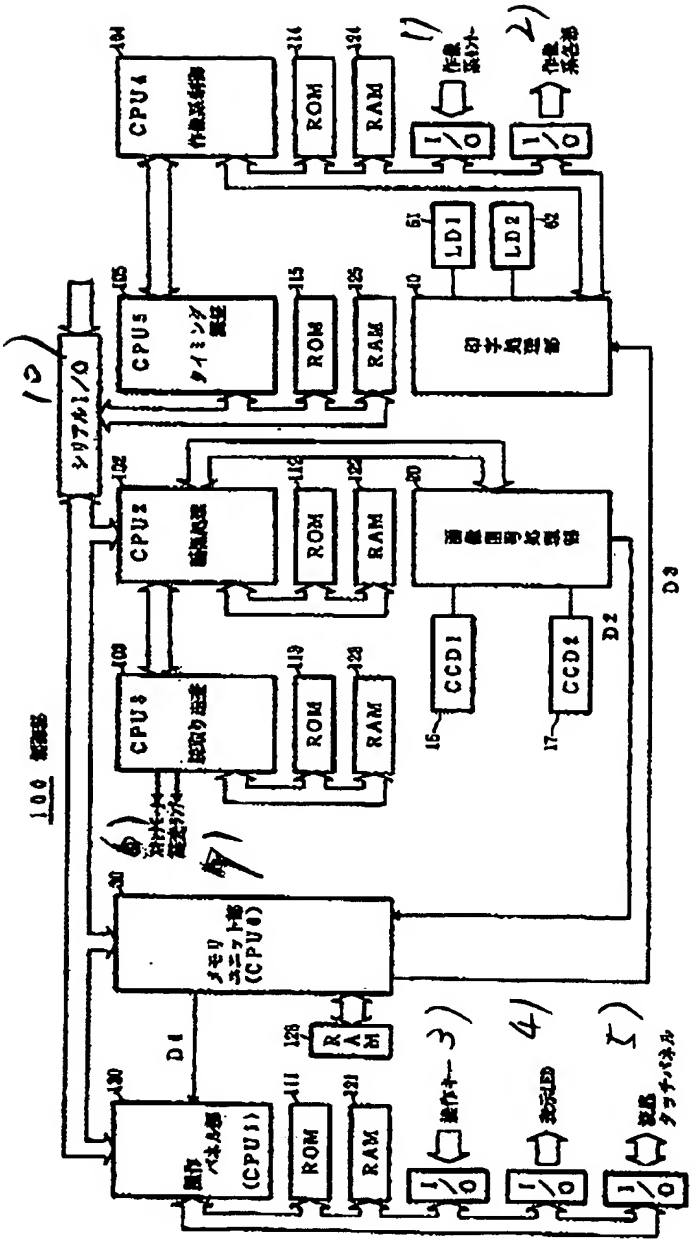
【図７】


91
HG7
1)
2) ボーリング大会のご案内
3) 先日ご案内致しましたボーリング大会について日程が決定致しましたのでお知らせ致します
記
日 時 2001年
場 所 駅前商店街
参加費 1000円程度
持参品 ボーリングの玉
4) 原稿を差し替えますか？ コピーキーを押すと読み込み開始
中 止
一枚目
一次頁
↑前頁
↓次頁

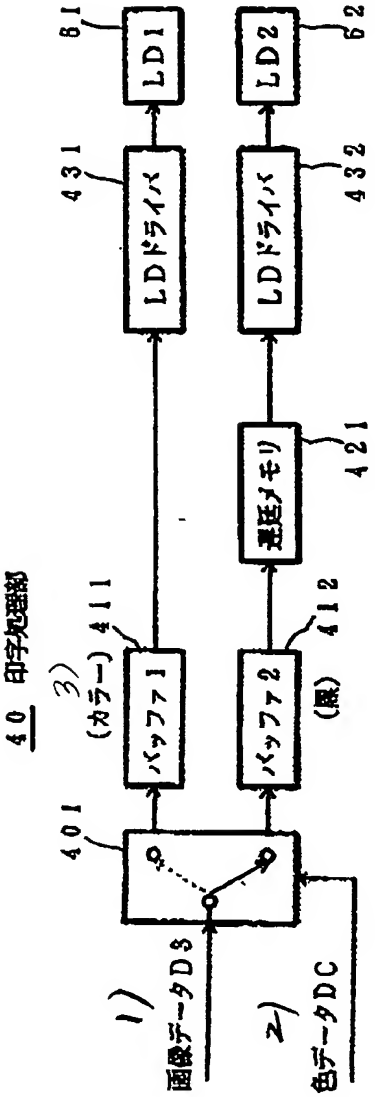
【図９】


1)
シリアルI／O
CPU7
107
6)
原稿搬送
CPU8
108
7)
再給紙
ROM
117
ROM
118
RAM
127
RAM
128
I／O
2)
原稿搬送部
センサ入力
I／O
4)
再給紙部
センサ入力
I／O
3)
原稿搬送部
駆動回路
I／O
5)
再給紙部
駆動回路

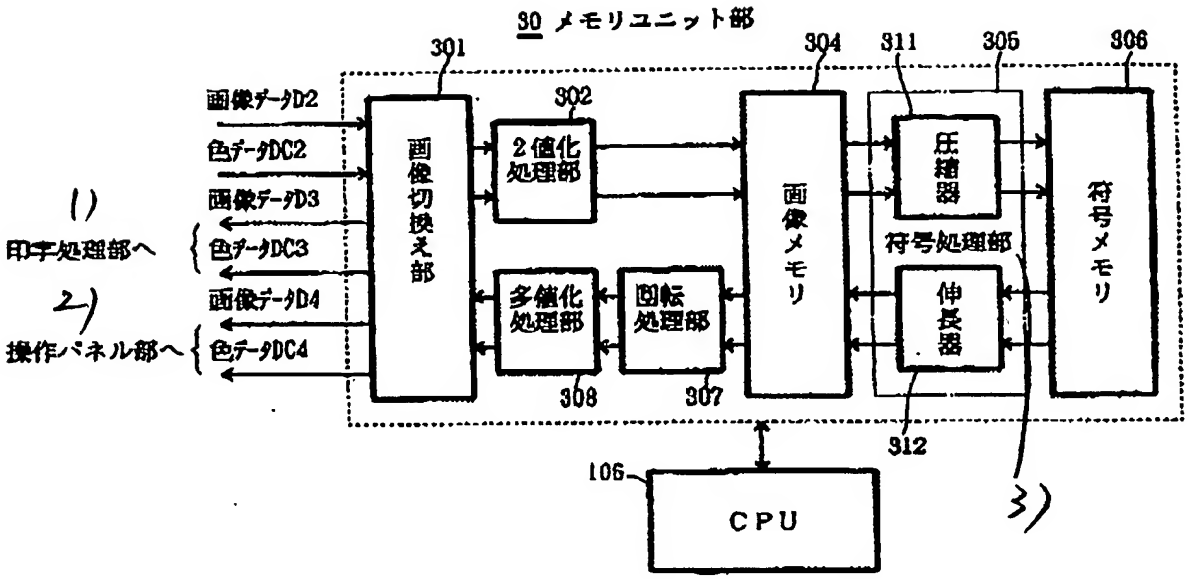
【図８】


CPU4
ROM
RAM
I/O
LD1
LD2
CPU5
タイミング
CPU2
CPU3
CCD1
CCD2
D1
D2
D3
RAM
CPU1
100

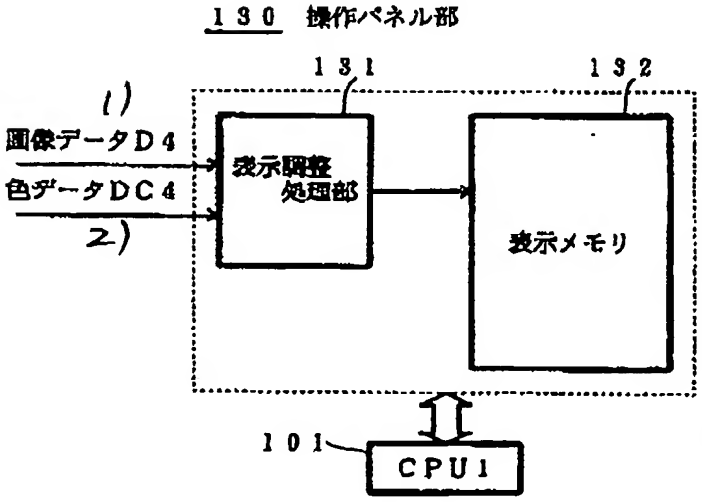
【図１４】


LD1
LD2
LDドライバ
LDドライバ
走査メモリ
バッファ1
バッファ2
(カラー)
(黒)
40 印字処理部
画像データD3
色データDC

【図１０】


30 メモリユニット部
301
304
311
305
306
画像データD2
色データDC2
画像データD3
色データDC3
画像データD4
色データDC4
画像切換え部
2値化処理部
302
多値化処理部
回転処理部
画像メモリ
圧縮器
伸長器
符号処理部
符号メモリ
308
307
312
106
CPU
1)
印字処理部へ
2)
操作パネル部へ
3)

【図１３】

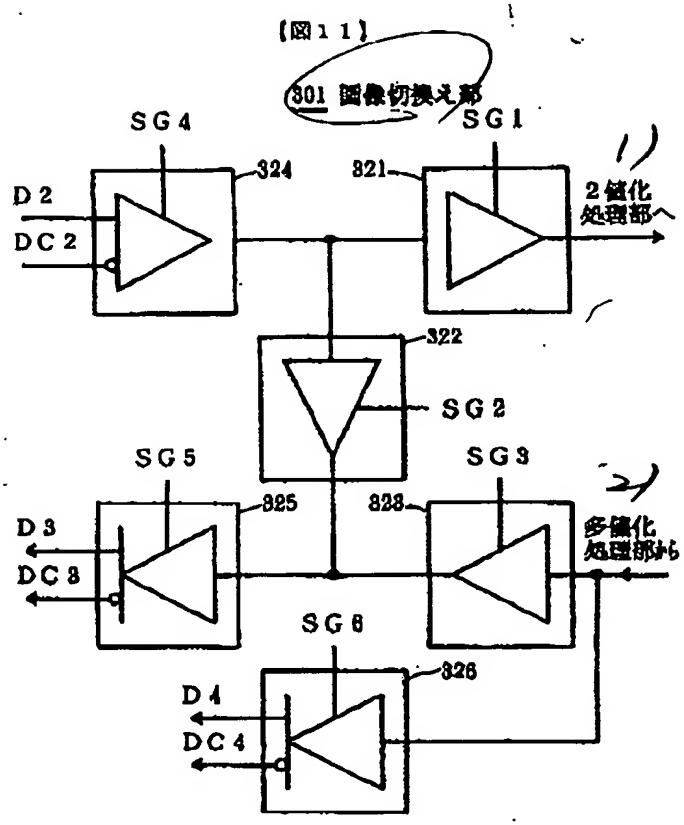

１３０ 操作パネル部
１３１
１３２
1)
画像データＤ４
色データＤＣ４
2)
表示調整処理部
表示メモリ
１０１
CPU1

【図３４】


ストア処理
初期化
コマンド受信
ステータス送信
画像メモリ書込み制御
圧縮制御
リターン
＃５６１
＃５６２
＃５６３
＃５６４
＃５６５

【図１１】

(a)



(b)

モード / 信号	メモリモード 書込み動作	メモリモード 読出し動作	直結モード	表示モード
SG1	A	N	N	X
SG2	N	N	A	X
SG3	N	A	N	X
SG4	A	X	A	X
SG5	X	A	A	X
SG6	N	N	N	A

A：アクティブ　N：ノンアクティブ　X：不定

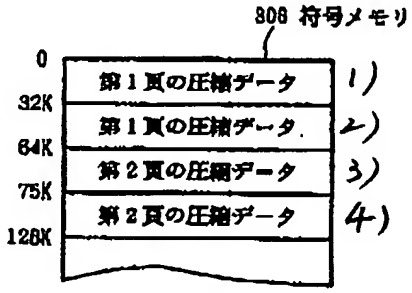
【図１２】

(a)

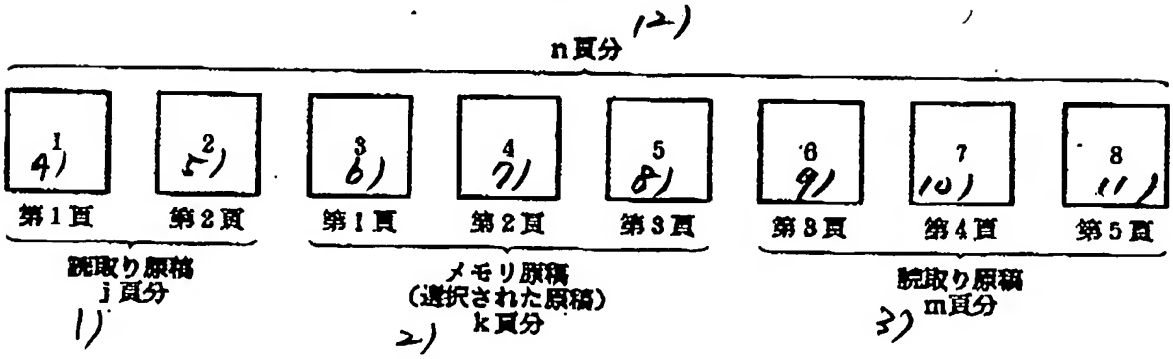
MT1

データNo.	圧縮データの領域	非圧縮データの領域	文書No.	頁	属性	圧縮状態	付加情報
0	0	—	1	1	黒	圧縮	
1	1	—	1	1	カラー	圧縮	
2	2	—	1	2	黒	圧縮	
3	3	—	1	2	カラー	圧縮	
4	—	500	1	3	黒	伸長	
5	—	700	1	3	カラー	伸長	
⋮							
⋮							

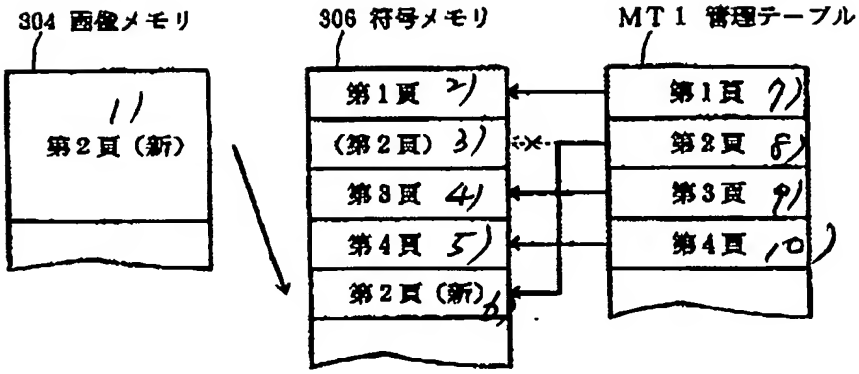
(b)



【図１５】

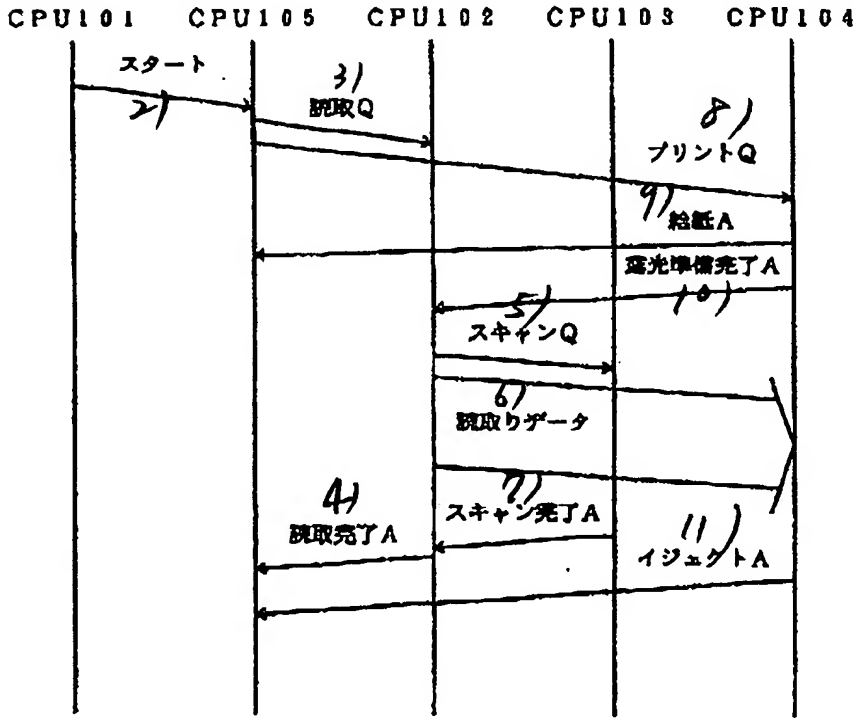


【図１７】

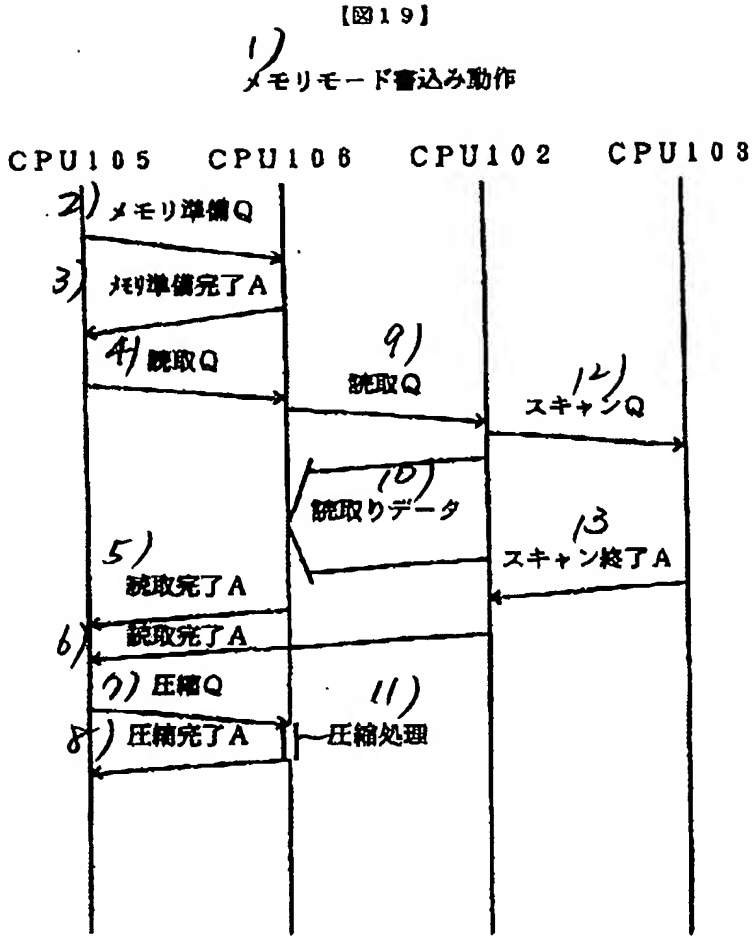


【図１８】

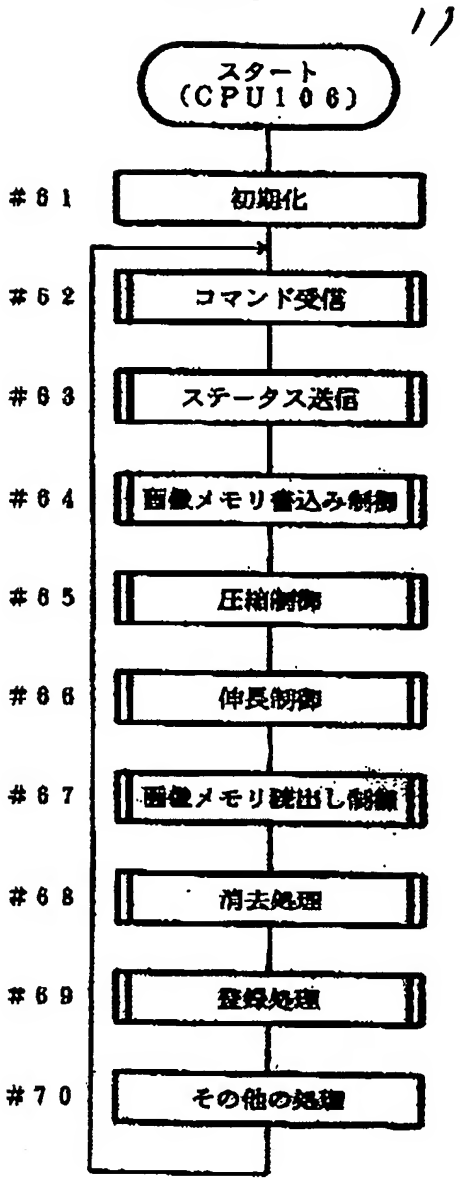
1)
直結モード



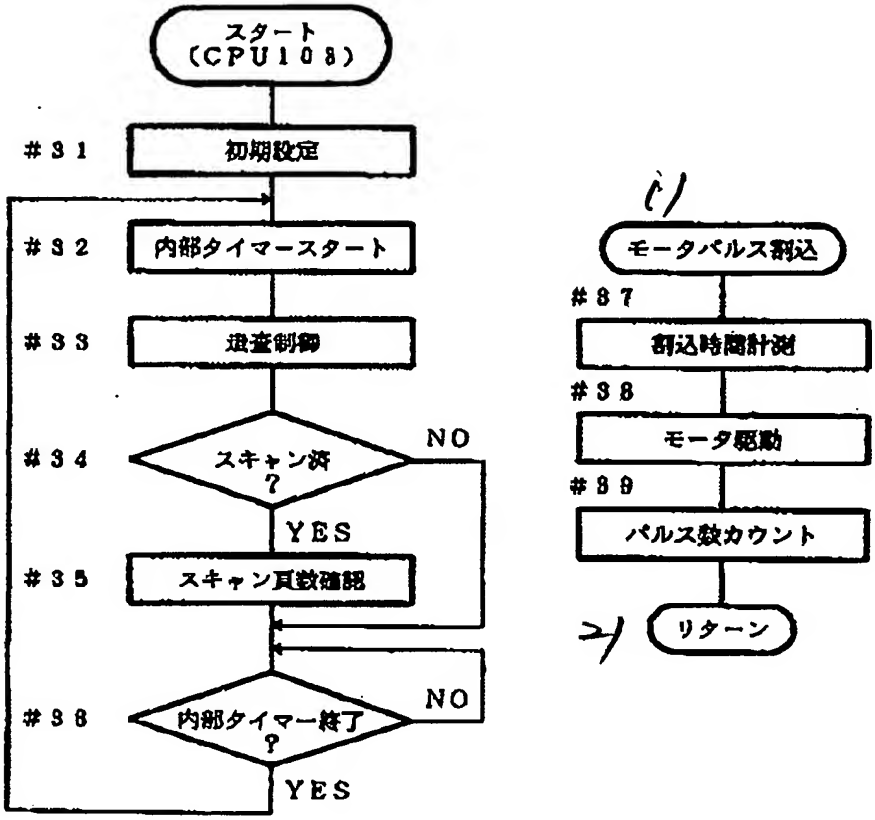
【図19】


1)
メモリモード書込み動作
CPU105
CPU106
CPU102
CPU103
2) メモリ準備Q
3) メモリ準備完了A
4) 読取Q
9) 読取Q
12) スキャンQ
10) 読取りデータ
13) スキャン終了A
5) 読取完了A
6) 読取完了A
7) 圧縮Q
11) 圧縮処理
8) 圧縮完了A

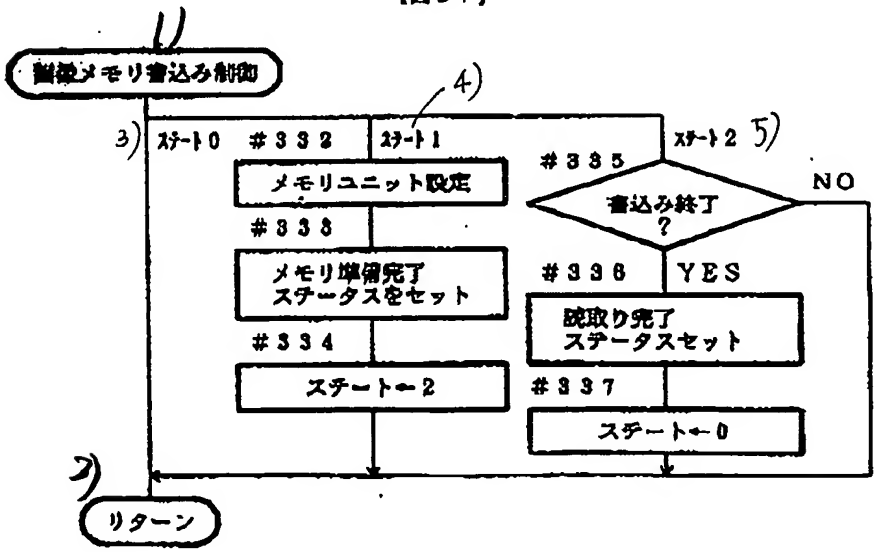
【図26】


11
スタート
(CPU106)
#61 初期化
#62 コマンド受信
#63 ステータス送信
#64 画像メモリ書込み制御
#65 圧縮制御
#66 伸長制御
#67 画像メモリ読出し制御
#68 消去処理
#69 登録処理
#70 その他の処理

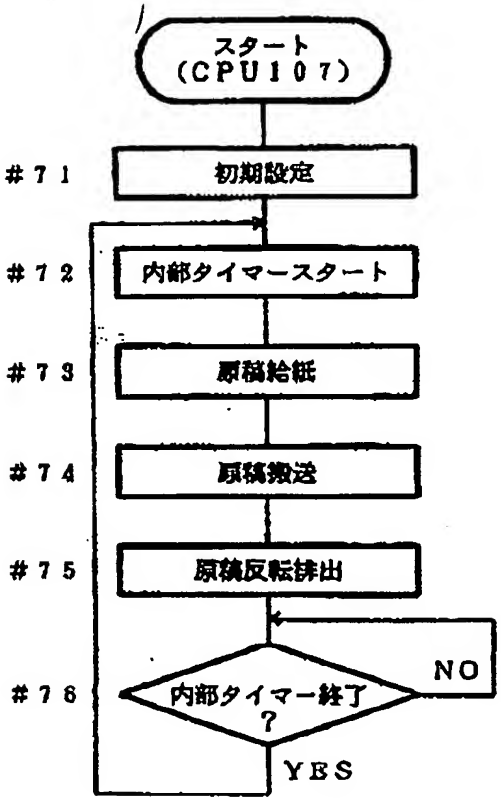
【図２３】


スタート
(CPU108)
#31
初期設定
#32
内部タイマースタート
#33
検査制御
#34
スキャン済?
NO
YES
#35
スキャン頁数確認
#36
内部タイマー終了?
NO
YES
1)
モータパルス割込
#37
割込時間計測
#38
モータ駆動
#39
パルス数カウント
2)
リターン

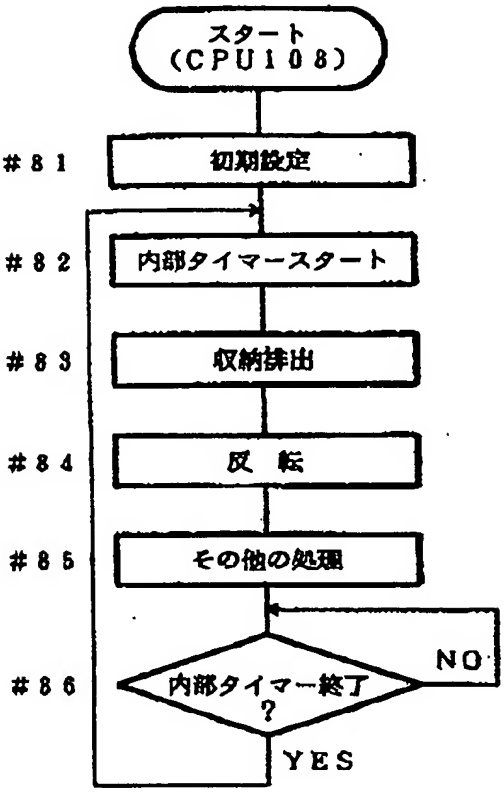
【図３７】


1)
画像メモリ書込み制御
3)
ステート0
#332
ステート1
4)
ステート2
5)
メモリユニット設定
#333
メモリ準備完了
ステータスをセット
#334
ステート←2
#335
書込み終了?
NO
#336
YES
読取り完了
ステータスセット
#337
ステート←0
2)
リターン

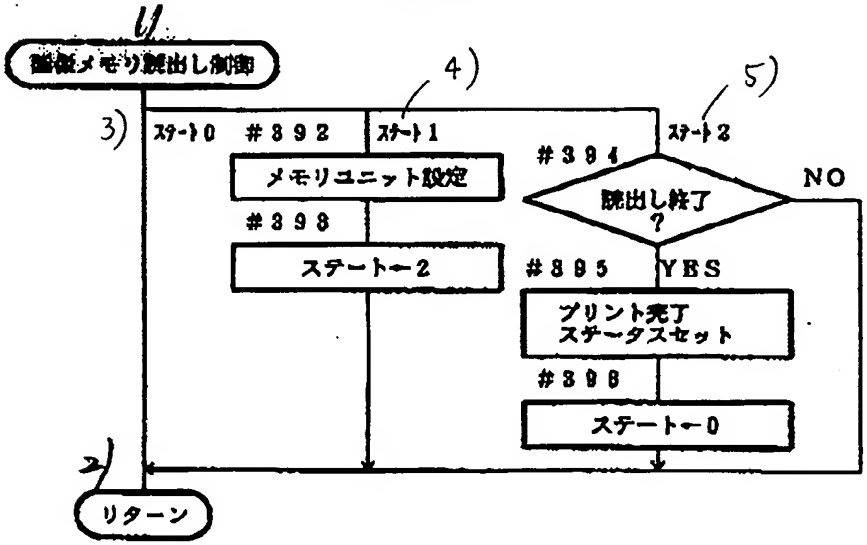
【図２７】


スタート
(CPU107)
#71
初期設定
#72
内部タイマースタート
#73
原稿給紙
#74
原稿搬送
#75
原稿反転排出
#76
内部タイマー終了
?
NO
YES

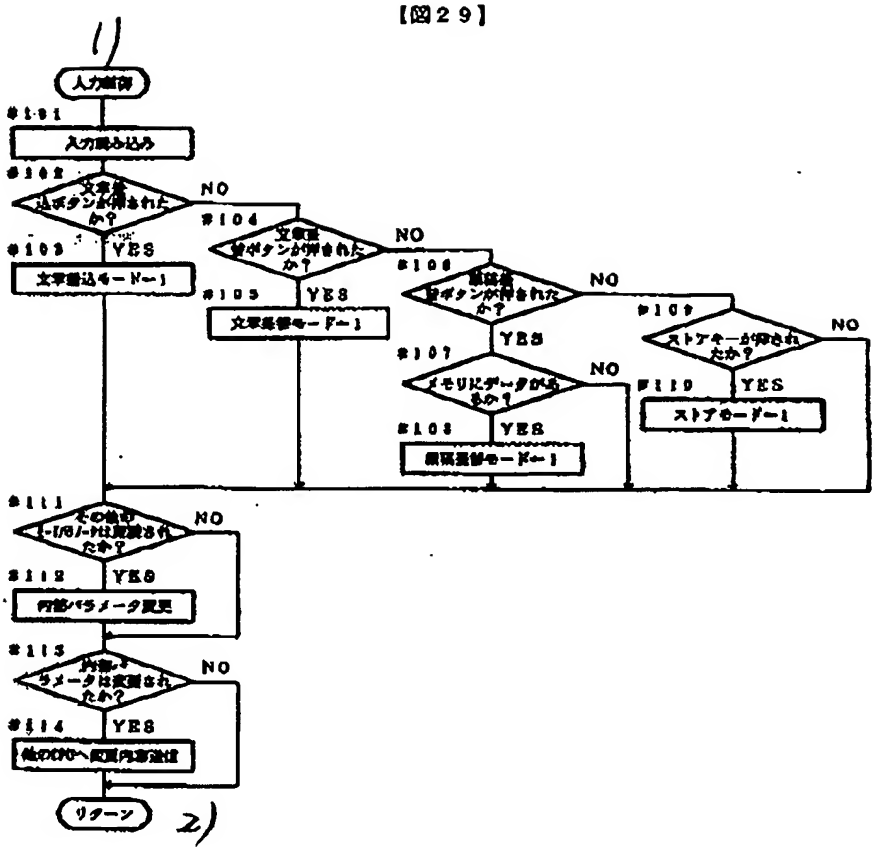
【図２８】


スタート
(CPU108)
#81
初期設定
#82
内部タイマースタート
#83
収納排出
#84
反　転
#85
その他の処理
#86
内部タイマー終了
?
NO
YES

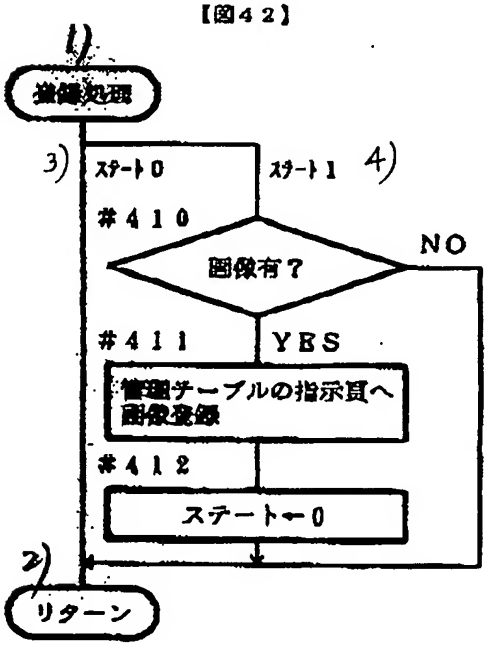
【図４０】


4)
5)
3)
ステート0
#892
ステート1
ステート2
#894
メモリユニット設定
読出し終了
?
NO
#898
ステート=2
#895
YES
プリント完了
ステータスセット
#896
ステート=0
リターン

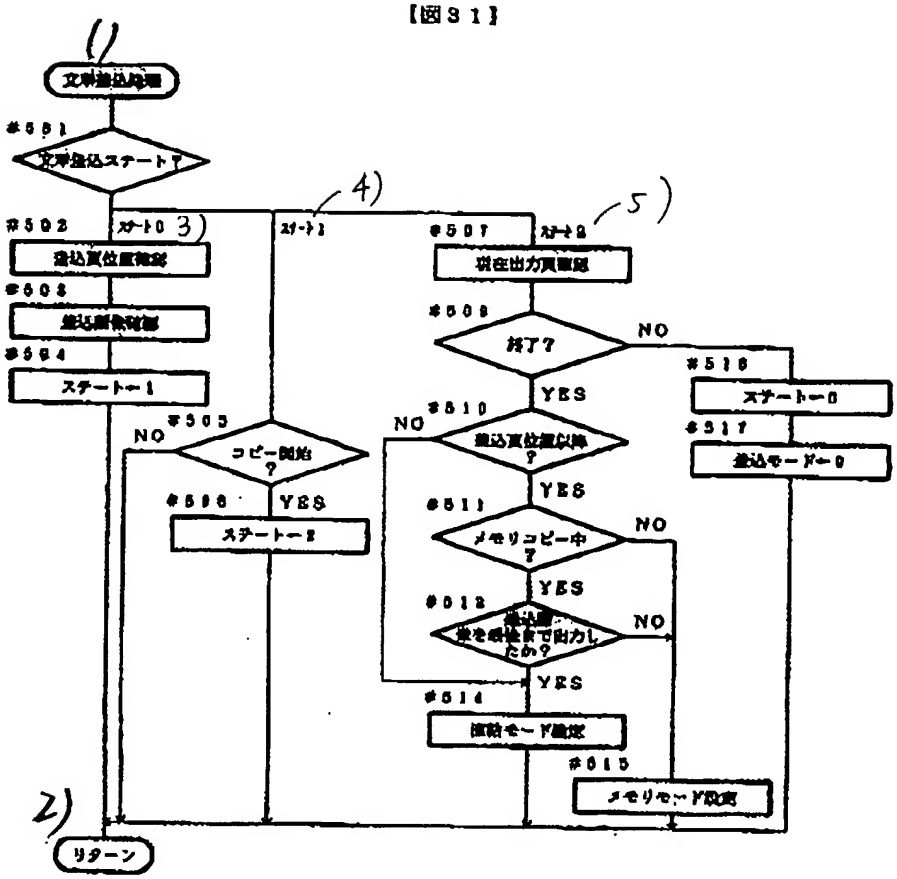
【図２９】


1)
入力処理
#101
入力読み込み
#102
文字挿込ボタンが押されたか?
NO
YES
#103
文字挿込モード=1
#104
文字置換ボタンが押されたか?
NO
YES
#105
文字置換モード=1
#106
削除ボタンが押されたか?
NO
YES
#107
メモリにデータがあるか?
NO
YES
#108
削除置換モード=1
#109
ストアキーが押されたか?
NO
YES
#110
ストアモード=1
#111
その他のI/Oポートは変換されたか?
NO
YES
#112
内部パラメータ変更
#113
内部パラメータは変更されたか?
NO
YES
#114
他のCPUへ変更内容送信
リターン
2)

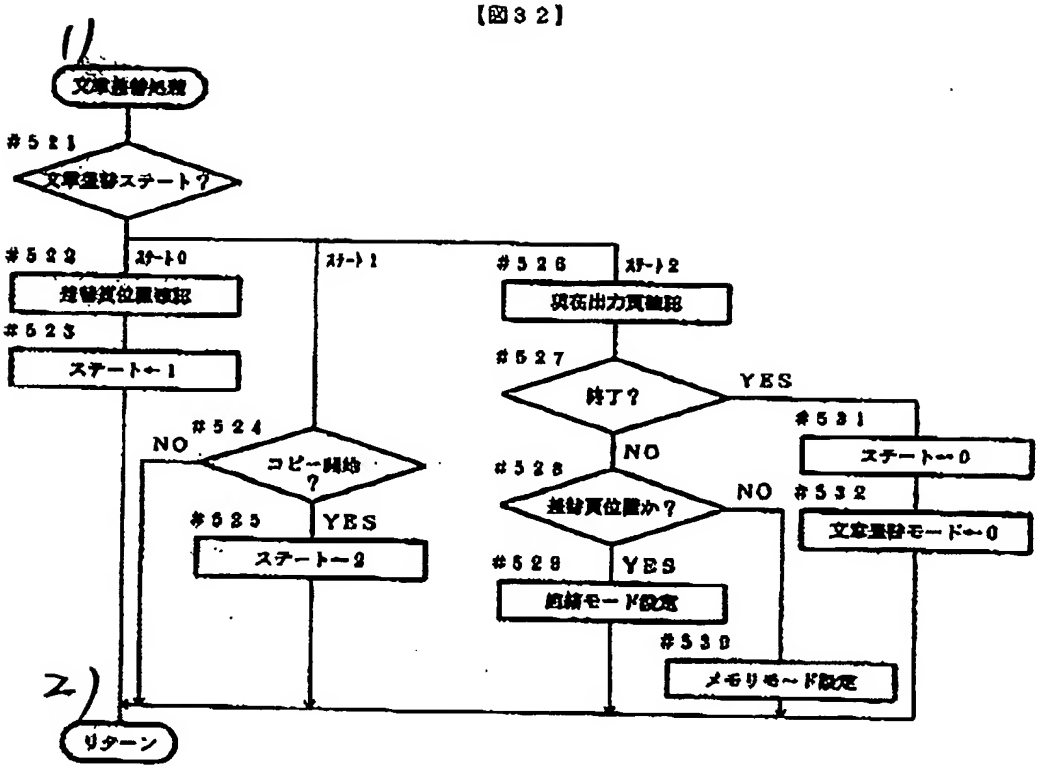
【図４２】


1)
登録処理
3)
ステート0
ステート1
4)
#410
画像有?
NO
#411
YES
管理テーブルの指示員へ画像登録
#412
ステート←0
2)
リターン

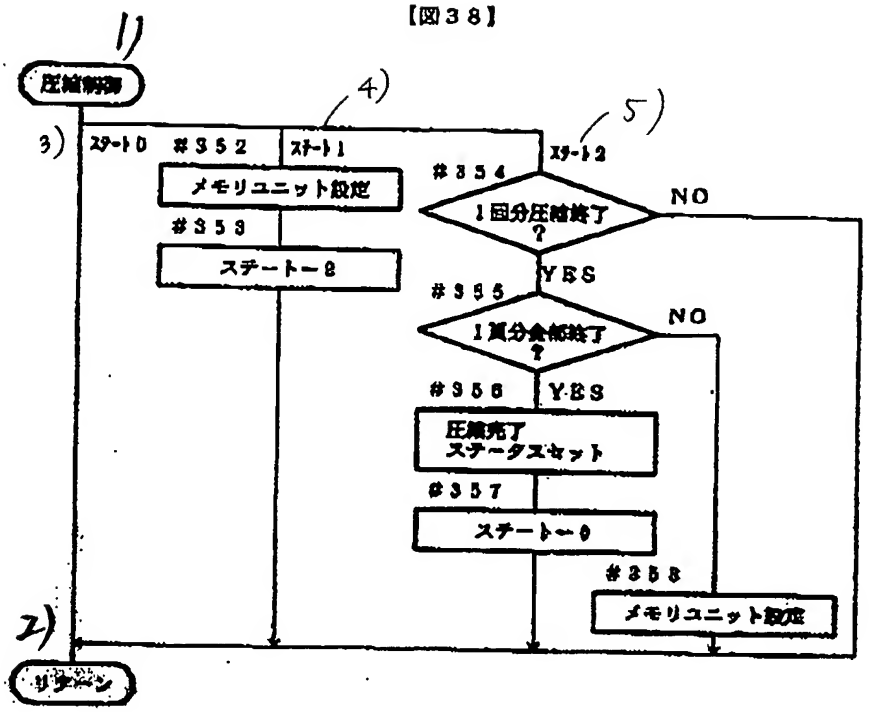
【図３１】


1)
#501
#502
ステート0
3)
#503
#504
ステート1
4)
#505
NO
コピー開始?
YES
#506
ステート2
#507
ステート3
5)
現在出力頁画像
#508
終了?
NO
YES
#509
NO
#510
YES
#511
メモリコピー中?
NO
YES
#512
NO
YES
#513
#514
#515
#516
ステート0
#517
2)
リターン

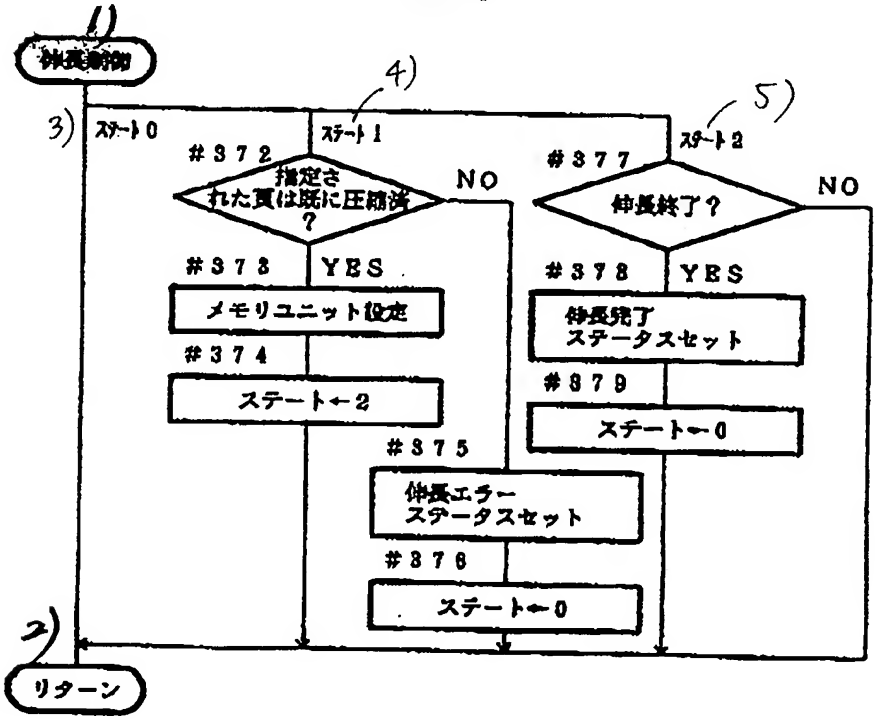
【図３２】


1
文章登録処理
#521
文章登録ステート?
#522
ステート0
登録頁位置検出
#523
ステート←1
ステート1
#524
NO
コピー開始?
YES
#525
ステート←2
#526
ステート2
現在出力頁検出
#527
終了?
YES
NO
#528
登録頁位置か?
NO
YES
#529
組織モード設定
#530
メモリモード設定
#531
ステート←0
#532
文章登録モード←0
2
リターン

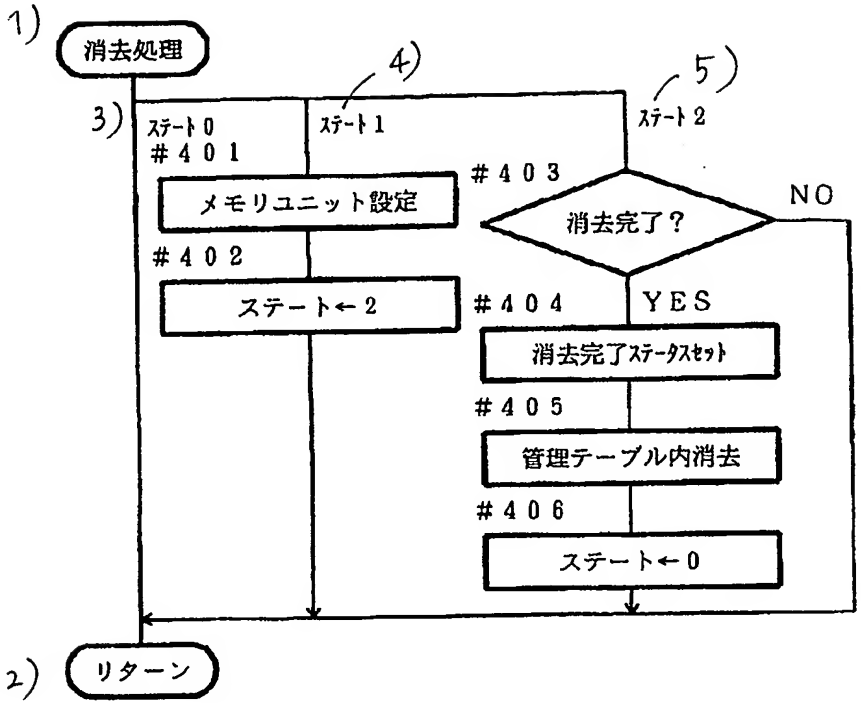
【図３８】


1)
圧縮制御
3)
ステート０
#３５２
ステート１
4)
ステート２
5)
メモリユニット設定
#３５３
ステート←２
#３５４
１回分圧縮終了？
NO
YES
#３５５
１頁分圧縮終了？
NO
YES
#３５６
圧縮完了
ステータスセット
#３５７
ステート←０
#３５８
メモリユニット設定
2)
リターン

【図３９】


1)
伸長制御
3)
ステート０
ステート１
4)
ステート２
5)
#３７２
指定された頁は既に圧縮済？
NO
YES
#３７３
メモリユニット設定
#３７４
ステート←２
#３７５
伸長エラー
ステータスセット
#３７６
ステート←０
#３７７
伸長終了？
NO
YES
#３７８
伸長完了
ステータスセット
#３７９
ステート←０
2)
リターン

【図４１】


1)
消去処理
4)
5)
3)
ｽﾃｰﾄ0
＃４０１
ｽﾃｰﾄ1
ｽﾃｰﾄ2
＃４０３
メモリユニット設定
消去完了？
NO
＃４０２
ステート←２
＃４０４
YES
消去完了ｽﾃｰﾀｽｾｯﾄ
＃４０５
管理テーブル内消去
＃４０６
ステート←０
2)
リターン

(11) Japanese Patent Laid-Open No. 5-292268

(43) Laid-Open Date: November 5, 1993

(21) Application No. 4-96197

(22) Application Date: April 16, 1992

(72) Inventors: YOSHIDA et al.

(71) Applicant: Minolta Camera Co., Ltd.

(74) Agent: Patent Attorney, Yukio KUBO

(54) [Title of the Invention] IMAGE FORMING APPARATUS

(57) [Abstract] (corrected)

[object] To provide an image forming apparatus in which it is necessary to read a commonly-used original copy at plural times and also to carry out the re-arrangement and the insertion of the paper-sheets after the copying.

[Constitution] In an image forming apparatus including an image reading unit for sequentially reading images on one page or at least two pages constituting an original copy to output image data, an image memory 304 and 306 for storing the image data of the original copy on a one-page basis, and a printer unit, the apparatus contains a memory unit 30 which comprises a memory original copy selection means for selecting an original copy composed of one page or at least two pages from an original copy stored in the image memory, an original copy sequence setting means for setting the mutual arrangement sequence of an original copy to be read

by the image reading unit and the original copy selected by the memory original copy selection means, and an output changing means for carrying out changing from the image data output from the image reading unit to the image data selected by the memory original copy selection means and read from the image memory, and vice versa, in the sequence set by the original copy sequence setting means, and outputting these image data to the printer.

[Claims]

[Claim 1] An image forming apparatus including an image reading unit for sequentially reading images on one page or at least two pages constituting an original copy to output image data, an image memory for storing the image data of the original copy on a one-page basis, and a printer unit for carrying out image-formation based on the image data, characterized in that the apparatus contains a memory original copy selection means for selecting one page or at least two pages constituting an original copy from the original copy composed of one page or at least two pages stored in the image memory in advance,

an original copy sequence setting means for setting the mutual arrangement sequence of an original copy to be read by the image reading unit and the original copy selected by the memory original copy selection means, and

an output changing means for carrying out changing from the image data output from the image reading unit to the image data selected by the memory original copy selection means and read from the image memory, and vice versa, in the sequence set by the original copy sequence setting means, and outputting these image data to the printer.

[Claim 2] An image forming apparatus according to Claim 1, characterized in that the apparatus contains an insertion mode display screen for setting a page position at which the

original copy selected by the memory original copy selection means is inserted in the original copy composed of at least two pages read by the image reading unit.

[Claim 3] An image forming apparatus according to Claim 1, characterized in that the apparatus contains a replacement mode display screen for selecting one original copy set composed of one page or at least two pages from the original copy stored in the image memory, and setting an original copy composed of one page or at least two pages selected from the one original copy set, said original copy composed of one page or at least two pages being not to be selected when the one original copy set is partially replaced by the original copy read by the image reading unit.

[Claim 4] An image forming apparatus including an image reading unit for sequentially reading images on one page or at least two pages constituting an original copy to output image data, an image memory for storing the image data of the original copy on a one-page basis, and a printer unit for carrying out image-formation based on the image data, characterized in that the apparatus contains

a memory original copy selection means for selecting one page or at least two pages constituting an original copy from the original copy composed of one page or at least two pages stored in the image memory in advance, and

an original copy replacement means for replacing the

image data of the original copy selected by the memory original copy selection means by the image data of an original copy read by the image reading unit.

[Detailed Description of the Invention]

[0001]

[Industrial Field of the Invention] The present invention relates to an image forming apparatus which is used, e.g., as a digital copying machine, and in particular to an image forming apparatus with which an original copy set on an original copy board to be read and an original copy stored in a memory are printed in a set page-sequence.

[0002]

[Prior Art] Generally, in digital copying machines, image data read by an image sensor such as CCD or the like can be stored (or contained) in a memory. Accordingly, the image data read from one set of original copy composed of one or at least two pages (one original copy set) is stored in the memory. The image data is read from the memory, and can be copied (printed) on paper-sheets in a required number for each image, if necessary. Thus, a so-called memory mode copy can be performed (Japanese Patent Laid-Open No. 3-97372).

[0003] Moreover, a copying machine has been proposed (Japanese Patent Laid-Open No. 60-114080), the machine having a memory mode in which image data stored in a memory

is read and copied on a paper-sheet, and a direct mode in which the image data read from an original copy is directly copied on a paper sheet. In both of the modes operated synchronously, images are combined and printed on one paper-sheet.

[0004]

[Problems to be Solved by the Invention] However, Referring to the above-described known copying machines, in the case in which plural original copy sets each containing a commonly-used original copy are distributed as data to the respective attendances of a conference, the original copy sets must be read at plural times, although the original copy sets contain a commonly-used original copy.

[0005] In particular, the following case is assumed; there are three kinds of original copy sets A, B, and C formed of original copies composed of pages in numbers a, b, and c, respectively, and the original copy sets contain a commonly-used original copy composed of m pages. When the original copy sets are read, it is necessary to read the original copy sets at times (a + b + c). In this case, for the commonly-used original copy composed of the m pages, it is necessary to read the same contents at three times. As a result, the reading at (m × 2) times is carried in vain.

[0006] Moreover, the case is assumed in which there are an original copy set D composed with the number d of pages, an

original copy set E having only the x th page different from that of the original copy set D, and an original copy set F having only the x th page different from that of the original copy set D. To obtain one copy of these original copy sets, it is necessary to read (d × 3) times similarly to the above-described case, although the number of the pages having different contents is only two, i.e., the most of the pages have the same contents.

[0007] To eliminate the above-described the vainness, the following is supposed: original copy sets each are divided into a commonly-used original copy and a not-commonly-used original copy, the commonly-used original copy is read only at one time, and is multi-copied at three times, the not-commonly-used original copies are copied at one time for each original copy set, and after all of the copy is completed, the copied paper-sheets are re-arranged and inserted for each original copy set.

[0008] However, this method has a problem in which it takes much time and labor to re-arrange the paper-sheets and so forth after the copy is carried out, and moreover, the place for such work must be secured. Particularly, in the case in which the commonly-used parts are different with the original copy sets, the sequence of the paper-sheets and the insertion positions tend to be set in error. This is an overburden for workers.

[0009] In view of the foregoing, it is an object of the present invention to provide an image forming apparatus in which for copying plural original copy sets each containing a commonly-used original copy, it is unnecessary to read the commonly-used original copy at plural times, and also to carry out the re-arrangement and the insertion of the paper-sheets after the copy is carried out.

[0010]

[Means for Solving the Problems] An image forming apparatus specified in Claim 1 of the present invention including an image reading unit for sequentially reading images on one page or at least two pages constituting an original copy to output image data, an image memory for storing the image data of the original copy on a one-page basis, and a printer unit for carrying out image-formation based on the image data, is characterized in that the apparatus contains a memory original copy selection means for selecting one page or at least two pages constituting an original copy from the original copy composed of one page or at least two pages stored in the image memory in advance, an original copy sequence setting means for setting the mutual arrangement sequence of an original copy to be read by the image reading unit and the original copy selected by the memory original copy selection means, and an output changing means for carrying out changing from the image data output from the

image reading unit to the image data selected by the memory original copy selection means and read from the image memory, and vice versa, in the sequence set by the original copy sequence setting means, and outputting these image data to the printer.

[0011] An apparatus specified in Claim 2 of the present invention is characterized in that the apparatus contains an insertion mode display screen for setting a page position at which the original copy selected by the memory original copy selection means is inserted in the original copy composed of at least two pages read by the image reading unit.

[0012] An apparatus specified in Claim 3 of the present invention is characterized in that the apparatus contains a replacement mode display screen for selecting one original copy set composed of one page or at least two pages from the original copy stored in the image memory, and setting an original copy composed of one page or at least two pages selected from the one original copy set, said original copy composed of one page or at least two pages being not to be selected when the one original copy set is partially replaced by the original copy read by the image reading unit.

[0013] An apparatus specified in Claim 4 of the present invention including an image reading unit for sequentially reading images on one page or at least two pages constituting an original copy to output image data, an image

memory for storing the image data of the original copy on a one-page basis, and a printer unit for carrying out image-formation based on the image data, is characterized in that the apparatus contains a memory original copy selection means for selecting one page or at least two pages constituting an original copy from the original copy composed of one page or at least two pages stored in the image memory in advance, and an original copy replacement means for replacing the image data of the original copy selected by the memory original copy selection means by the image data of an original copy read by the image reading unit.

[0014]

[Operation] An original copy to be read is selected from an original copy stored in the image memory in advance by the memory original copy selection means. The mutual arrangement sequence of an original copy read by the image reading unit and the original copy selected by the memory original copy selection means is set on a one-page basis by the original copy sequence setting means.

[0015] The output changing means carries out changing from the image data output from the image reading unit to the image data selected by the memory original copy selection means and read from the image memory, and vice versa, in the specified sequence, and outputs these image data to the

printer. The printer prints the image data in the sequence.

[0016] By use of the insertion mode display screen, a page position at which the original copy selected by the memory original copy selection means is inserted in an original copy read by the image reading unit is set. By use of a replacement mode display screen, one original copy set of the original copy stored in the image memory, the original copy set being to be replaced by an original copy read by the image reading unit, is set.

[0017] The image data of the original copy selected by the memory original copy selection means is replaced by the image data of the original copy read by the image reading unit.

[0018]

[Embodiment] First, terms used in this patent specification are described. In some cases, an original copy set on an original copy board (original copy glass 18) is referred to as "read original copy", and an original copy stored as image data in a memory (an image memory 304 or a code memory 306) is referred to as "memory original copy".

[0019] In some cases, one set of original copy composed of one page or at least two pages is referred to as "original copy set", "text", or the like. Especially, when it is desired to emphasize that the original copy is a memory original copy controlled as one set of original copy by a

device, the original copy is referred to as "text" in some cases.

[0020] Fig. 1 is a cross-sectional front view showing the whole configuration of a copying machine 1 according to the present invention. Fig. 2 is a front view of a manipulation panel OP. In these drawings, the copying machine 1 comprises a scanning system 10 for reading an original copy and converting it to an image signal, an image signal processing unit 20 for processing the image signal supplied from the scanning system 10, a memory unit 30 for switching for outputting the image data as it is to a printer unit, or for storing the image data in a memory, the image data being input from the image signal processing unit 20, a printing unit 40 for driving two semiconductor lasers 61 and 62 based on the image data input from the memory unit 30, an optical system 60 for guiding two laser beams from the semiconductor lasers 61 and 62 to exposure positions different from each other on a photoconducting drum 71, an image-forming system 70 for developing a latent image formed by the exposure, and transferring and fixing the image onto a paper sheet, a manipulation panel OP disposed on the upper surface on the body of the copying machine 1, an original copy conveying unit 500 for conveying an original copy, and reversing the copy, if necessary, and a paper re-feeding unit 600 for supplying the sheet paper to the transfer position again.

[0021] A reader unit IR comprises the scanning system 10, the image signal processing unit 20, and so forth. A printer unit PRT comprises the printing unit 40, the optical system 60, the image-forming system 70, and so forth.

[0022] The scanning system 10 comprises an exposure lamp 11 mounted on a scanner 19, a first mirror 12, second and third mirrors 13a and 13b, a collecting lens 14, a dichroic mirror 15, photoelectric transducers 16 and 17, a scan motor M2, and so forth.

[0023] The dichroic mirror 15 causes a particular color such as a red color of the light reflected from the original copy to reflect therefrom, and causes a complementary color light for the particular color to transmit therethrough. The photoelectric transducers 16 and 17 convert images having a non-particular color, e.g., mainly having a black color on the original copy, and images having a particular color (red color) to electric signals, individually.

[0024] The image signal processing unit 20 processes the image signals output from the two photoelectric transducers 16 and 17, identifies the respective pixels of the original copy image having the particular color (second color) and the other colors (first color), and outputs the image data having color data to the memory unit 30. The memory unit 30 will be described below.

[0025] The printing unit 40 divides and transfers the

supplied image data having colors to the semiconductor lasers 61 and 62 correspondingly to the image data, and causes the semiconductor lasers 61 and 62 to delay the image data to be given to one 62 of the semiconductor lasers, corresponding to the difference between the exposure positions.

[0026] The optical system 60 comprises the semiconductor lasers 61 and 62, a dichroic mirror 63 for combining two laser beams, a polygon mirror 65 for deflecting the combined laser beam, a main lens 69, a reflection mirror 67a, a dichroic mirror 68 for separating the combined laser beam into the original two laser beams, reflection mirrors 67b and 67c, and so forth.

[0027] The image-forming system 70 comprises a developing transfer system 70A, a conveying system 70B, and a fixing system 70C. The developing transfer system 70A comprises the photoconducting drum 71 to be driven so as to rotate counterclockwise in Fig. 1, a first electric charger 72a, a first developing device 73a, a second electric charger 72b, a second developing device 73b, a transfer charger 74, a separation charger 75, a cleaning portion 76, and so forth arranged sequentially from the upstream side in the rotation direction around the periphery of the photoconducting drum.

[0028] The first developing device 73a accommodates a two-component developing agent comprising a red-color toner

corresponding to the second color and a carrier. The second developing device 73b accommodates a two-component developing agent comprising a black-color toner corresponding to the first color and a carrier.

[0029] The conveying system 70B comprises cassettes 80a and 80b for accommodating paper-sheets, size-detection sensors SE11 and 12 for detecting the size of a paper-sheet, a sheet guide 81, a timing roller 82, a conveyer belt 83, horizontal conveyer rollers 86a to 86c for conveying a paper-sheet supplied from the paper re-feeding unit 600, and so forth.

[0030] The fixing system 70C comprises fixing rollers 84 and 84, a discharge roller 85, a discharge sensor SE62 for detecting the discharge of a paper-sheet, and so forth. The paper re-feeding unit 600 is a circulation type, and accommodates a paper-sheet discharged through the discharge roller 85, and conveys the paper-sheet to the horizontal conveyer roller 86a of the conveying system 70B after the paper-sheet is reversed in the case of a both-side mode, or without the paper-sheet being reversed in the case of a composite mode. The paper re-feeding unit 600 comprises a changing pawl 601 for changing the discharge of a paper-sheet to a paper-sheet discharge tray 621 and the paper-sheet re-feeding to each other, a conveyer roller 602, a reverse roller 603, a reverse sensor SE61, and so forth.

[0031] In the both-side mode, the left--end of the changing

pawl 601 is moved upward by means of a solenoid (not shown). Thereby, the paper-sheet discharged from the discharge roller 85 is guided toward the conveyer roller 602, passes the conveyer roller 602, and reaches the reverse roller 603.

[0032] When the rear end of the paper-sheet reaches the reverse sensor SE61, the reverse roller 603 is reversed, so that the paper-sheet is conveyed toward the horizontal conveyer roller 86a passes the horizontal conveyer rollers 86b and 86c, and reaches the timing roller 82 to be held. In this case, the succeeding paper-sheets are sequentially conveyed at predetermined intervals. The number of paper-sheets copied on one side surface thereof which can be held depends on the lengths of the paper-sheets, provided that no delay of the image data occurs.

[0033] The original copy conveying unit 500 automatically conveys an original copy set on an original copy feeding tray 510, onto the original copy glass 18, and discharges the original copy to an original copy discharge portion 511 after the original copy is read by the scanner 19.

[0034] The original copy conveying unit 500 comprises a feeding roller 501, a handling roller 502, a handling pad 503, an intermediate roller 504, a resist roller 505, a conveyer belt 506, a reverse roller 507, a changing pawl 508, the discharge roller 509, the feeding tray 510, the discharge tray 511, an original copy scale 512, a feeding

sensor SE51, a discharge sensor SE52, and so forth.

[0035] One set of original copy composed of one page or at least two pages is set on the feeding tray 510. In the one-side mode, the one sides of the pages are read, and in the both-side mode, the both sides of the pages are read in which the respective original copies are reversed.

[0036] For example, in the one-side mode, the set original copies are conveyed by means of the feeding roller 501 sequentially from the original copy at the lowest position. The conveyed original copy is handled by means of the handling roller 502 and the handling pad 503, and passes the intermediate roller 504. The slippage of the original copy is corrected by the resist roller 505, and the original copy is conveyed onto the original copy glass 18 by means of the conveyer belt 506. Immediately after the rear end of the original copy passes the left-end of the original copy scale 512, the conveyer belt 506 is slightly reversed and stops. Thereby, the right-end (rear end) of the original copy causes to hit on the edge of the original copy scale 512. Thus, the original copy is accurately positioned on the original copy glass 18.

[0037] In this state, the front surface (lower surface) of the original copy is scanned by the scanner 19 to be read. After the reading of the original copy is completed, the original copy is conveyed toward the left-side by means of

the conveyer belt 506, is turned back by means of the reverse roller 507, passes over the changing pawl 508, and is discharged onto the discharge portion 511 by means of the discharge roller 509. These operations are repeated until all of the original copies have been conveyed from the feeding tray 510.

[0038] In a memory mode or store mode (described below), the image data of an original copy is stored in a memory (image memory 304 or code memory 306) simultaneously with the reading of the original copy. All of a series of the set original copies are read. Thus, the reading job for the original copy set is completed. The image data of the original copy set stored in the memory is controlled as one text.

[0039] Referring to Fig. 2, the manipulation panel OP is provided with a liquid crystal panel 91, a ten key 92 for inputting the number of set sheets and a magnification, a clear key 93 for restoring the number of set sheets to the reference value of 1, and so forth, a panel reset key 94 for restoring a set value in the copying machine 1 to the reference value, and so forth, a stop key 95 for stopping the copy operation, a start key 96 for starting the copy operation, a mode set key 97 for setting a copy mode, a store key 99 for setting a store mode, and mode display portions 97a to 97d for displaying a copy mode.

[0040] The liquid crystal panel 91 displays the different states of the copying machine 1 such as the generation of JAM, the generation of a service man call, the generation of "paper-empty", and the like, the operation modes of the copying machine 1 such as an exposure level, a magnification, a paper-sheet, and the like, and different kinds of other information. Moreover, the liquid crystal panel 91 is used for inputting when an operation mode is selected.

[0041] A text insertion button 98a for selecting a text insertion mode in which the output for copying of a memory original copy is inserted while a read original copy is output for copying, a text replacement button 98b for selecting a text replacement mode in which a part of the output for copying of a memory original copy is replaced by the output for copying of a read original copy, an original copy replacement button 98c for selecting an original copy replacement mode in which a part of original copies stored in the memory is replaced, and so forth are displayed on the initial screen HG0 of the liquid crystal panel 91.

[0042] When these buttons 98a to 98c are pushed (touched) so that the respective modes are selected, the next screens are caused to appear, and images for checking the different buttons and the instructed text contents are displayed, respectively.

[0043] Hereinafter, the text insertion mode, the text

replacement mode, the original copy replacement mode, and the store mode will be described. Fig. 15 illustrates the operation carried out in the text replacement mode.

[0044] In the text replacement mode, j pages (in this example, two pages) of read original copy are sequentially copied printed). Thereafter, k pages (in this example, three pages) of memory original copy are sequentially copied. Thereafter, m pages (in this example, three pages) of read original copy are sequentially copied. As a result, a copy composed of a total of n pages (in this example, eight pages) of original copy can be obtained.

[0045] In particular, in the text replacement mode, (j + m) pages of original copy are set on the feeding tray 510. The text number of memory original copy, the k pages of the text, and the insertion positions are specified via the manipulation panel OP. Thus, the memory original copies are inserted, while the set read original copies are copied, are copied. The copied paper-sheets are discharged onto the paper-sheet discharge tray 621 in the above-described sequence.

[0046] Fig. 16 illustrates the operation carried out in the text replacement mode. According to the text replacement mode, n pages (in this example, eight pages) of memory original copy are copied from the first page to the last page, in which the g th page (in this example, the fifth

page) of the original copy is replaced by a read original copy. As a result, a copy composed of a total of n pages in which the g th page is replaced can be obtained. The number of pages of replacing original copy, i.e., the number of pages of replaced original copy may be two or more.

[0047] In particular, in the text replacement mode, a memory original copy is selected by inputting the text number via the manipulation panel OP, the g th page of the selected memory original copy is specified as an original copy not to be selected, and moreover, the predetermined pages of original copy are set on the feeding tray 510. Thus, while the memory original copies are copied, one of the memory original copies is replaced by the read original copy. Thus, the original copies are copied. The copied paper-sheets are discharged onto the paper-sheet discharge tray 621.

[0048] It is to be noted that when the read original copies are copied, the image data is stored simultaneously with the copying. However, if the memory region is not sufficient, the image data is not stored. This change is carried out by means of an image-changing portion 301. The replaced memory original copy are stored as it is, not be erased.

[0049] Fig. 17 illustrated the operation carried out in the original copy replacement mode. Fig. 17 illustrates the relations between an image memory 304, a code memory 306,

and a control table MT1, when the copying machine 1 is operated in the original copy replacement mode.

[0050] In the original copy replacement mode, the original copy in the h th page of a specified text can be replaced by a read original copy. The number of replacing original copies, i.e., that of replaced original copies may be two or more.

[0051] In particular, in the original copy replacement mode, the text number and the h th page are selected via the manipulation panel OP, and a predetermined number of pages of original copy are set on the feeding tray 510. Thus, the set original copies are read, replacing the h th page, and then are stored. In the case of the original copy replacement mode, printing is not carried out.

[0052] For example, in the case in which the second page is replaced, the image data in the second page of original copy stored in a code memory 306 is erased, and thereafter, the image data of the read original copy is written in the image memory 304, and is encoded and newly written in another region of the code memory 306, as shown in Fig. 17. In the control table MT1, the registration of the region for the erased second page is excluded, and the region for the newly written second page is registered. Thus, after this, the newly written image data is used in the second page.

[0053] In the store mode, commonly used original copies are

read and stored in the memory in advance. Therefore, for the memory original copies for use in the above-described text insertion mode, the text replacement mode, or the like, the original copies for the memory ones are read and stored in the store mode. In the store mode, original copies to be stored in the memory are selected by an operator, and are set on the feeding tray 510. Then, the store key 99 is pushed. Thus, the processing is carried out.

[0054] Hereinafter, an operation method for the liquid crystal panel 91 and the operation will be described in detail with reference to the respective screens displayed on the liquid crystal panel 91 in the modes. Figs. 3 and 4 illustrate screens HG 1 to 3 appearing on the liquid crystal panel 91 in the text insertion mode. Figs. 5 and 6 illustrate screens HG 4 to 6 appearing on the liquid crystal panel 91 in the text replacement mode. Fig. 7 illustrates a screen HG 7 appearing on the liquid crystal panel 91 in the original copy replacement mode.

[0055] When a text insertion button 98a is pushed on the screen HG0 shown in Fig. 2, the screen HG1 for selecting a text to be inserted, and a starting page thereof appears, as shown in Fig. 3(a).

[0056] The selected text number and the selected number of pages are displayed in the right upper part of the screen HG1, and the contents are displayed in the center thereof.

Moreover, an execution button 98a1 for displaying the next screen, a stop button 98a2 for displaying the initial screen, a preceding text button 98a3 and a following text button 98a4 for selecting a text, and a preceding page button 98a5 and a following text page button 98a6 for selecting a page are displayed.

[0057] Accordingly, a text to be inserted and the starting page thereof can be selected by operating the buttons 98a1 to 98a6 on the screen HG1. The contents in the selected page are displayed in the center of the screen.

[0058] The execution button 98a1 is pushed on the screen HG1, and thereby, the selected text and starting page are input and established. Then, as shown in Fig. 3(b), the screen HG2 for selecting the last page to be inserted and an insertion page position of read original copy is displayed.

[0059] An execution button 98a7 and a stop button 98a8, an image selection button 98a9 for moving a cursor CU alternately, and page-change buttons 98a10 and 98a11 are displayed on the screen HG1.

[0060] Accordingly, the last page to be inserted and the insertion page position can be selected by moving the cursor CU to a desired position by use of the image selection button 98a9, and operating the page-change buttons 98a10 and 98a11 on the screen HG2.

[0061] The execution button 98a7 is pushed on the screen

HG2, and thereby, the last page and the insertion page position are input and established. Then, as shown in Fig. 4, the screen HG3 for checking the selected contents appears. It is displayed on the screen HG3 that the first to third pages of a text 3 is inserted after the second page of a original copy to be read. That is, the original copy to be inserted is inserted after the insertion page position.

[0062] Then, the start key 96 is pushed, and thereby, the original copies set on the feeding tray 510 are sequentially read and copied, and the first to third pages of the text 3 read from the image memory 304. Thereafter, the original copies on the feeding tray 510 are copied. Thus, the copied paper-sheets are discharged in this sequence onto the paper-sheet discharge tray 621.

[0063] When the text replacement button 98b is pushed on the screen HG0 shown in Fig. 2, the screen HG4 for selecting a replacement text appears as shown in Fig. 5(a).

[0064] Similarly to the case of the screen HG1, a text number and the number of pages, which are selected, are displayed in the left upper part of the screen HG4, and the contents are displayed in the center thereof. Moreover, an execution button 98a21, a stop button 98a22, a preceding text button 98a23 and a following text button 98a24, and a preceding page button 98a25 and a following text page button 98a26 are displayed.

[0065] Accordingly, a replacement text can be selected by operating the preceding text button 98a23 and the following text button 98a24 on the screen HG4. The execution button 98a21 is pushed on the screen HG4, and thereby, the selected text is input and established. Then, as shown in Fig. 5(b), the screen HG5 for selecting a replacement page position (the page of the memory to be replaced) appears.

[0066] The list LT1 of the pages contained in the selected text is displayed in the center of the screen HG5. Moreover, an execution button 98a27, a stop button 98a28, an image checking button 98a29, and cursor buttons 98a30 and 98a31 for moving a cursor CU are displayed on the screen HG5.

[0067] Accordingly, the replacement page position can be selected by moving the cursor CU to the position of a page to be replaced with the cursor buttons 98a30 and 98a31. The page number is displayed in the left upper part. The execution button 98a27 is pushed, and thereby, the replacement page position is input and established. Then, as shown in Fig. 6, the screen HG6 for checking the selected contents appears. On the screen HG6 shown in Fig. 6, it is displayed on the screen HG6 that a text 3 is selected, and the fifth page of the text 3 is replaced by an original copy to be read.

[0068] Then, the start key 96 is pushed, and thereby, the text 3 is read from the image memory 304 and copied

sequentially from the first page thereof. After the fourth page is copied, the original copy on the feeding tray 510 is read instead of the next fifth page, and is copied as the fifth page. Thereafter, the sixth page and the subsequent pages of the text 3 are copied. The paper-sheets copied are discharged onto the paper-sheet discharge tray 621 in the above-described sequence.

[0069] When the original copy replacement button 98c is pushed on the screen HG0 shown in Fig. 2, the screen HG7 for selecting a text and a page for original copy replacement appears as shown in Fig. 7.

[0070] Similarly to the case of the screen HG1, a text number and a page number are displayed for selection in the left upper part of the screen HG7, and the contents are displayed in the center thereof. Moreover, a stop button 98a42, a preceding text button 98a43 and a following text button 98a44, and a preceding page button 98a45 and a following text page button 98a46 are displayed.

[0071] Accordingly, the text and the page for original copy replacement can be selected by operating the buttons 98a43 to 98a46 on the screen HG7. It is displayed on the screen HG7 shown in Fig. 7 that the image data of the first page of the text 3 is replaced by the image data of an original copy to be read.

[0072] Then, the start key 96 is pushed, and thereby, the

image data of the first page of the text 3 stored in the memory is erased, the original copy set on the original copy feeding tray 510 is read, and the image data is newly stored in the memory. Thus, the image data replaces the first page of the text 3. It is to be noted that no printing is carried out.

[0073] Hereinafter, a control unit 100 will be described. Figs. 8 and 9 are block diagrams showing the configuration of the control unit 100 of the copying machine 1. The control unit 100 has eight CPUs 101 to 108 as essential components. ROMs 111 to 118 in which programs are stored, respectively, and RAMs 121 to 128 which function as program execution work areas are provided in the CPUs 101 to 108. The CPU 106 is provided in the memory unit 30, and the CPU 101 in the memory unit 30, respectively (see Figs. 10 and 13).

[0074] The CPU 101 carries out the control on the input of a signal and the display which are made by the operation keys and the operation buttons on the manipulation panel OP. The CPU 102 controls the respective portions of the image signal processing unit 20. The CPU 103 controls over the driving of the scanning system 10. The CPU 104 controls the printing unit 40, the optical system 60, and the image-forming system 70. The CPU 105 carries out the overall timing adjustment and the operation mode setting of the

control unit 100.

[0075] The CPU 106 controls the memory unit 30, so that image data read is stored in a memory (the image memory 304 or the code memory 306), and reads the image data from the memory to output it to the printing unit 40.

[0076] The CPU 107 controls the original copy conveying unit 500. The CPU 108 controls the paper re-feeding unit 600. By interruption, serial communication is made between the CPUs 101 to 108. Thus, a command, a report, and other data are send or received between them.

[0077] Hereinafter, the respective processing units for processing image data will be described. The image signal processing unit 20 comprises an A/D converter, a shading correcting unit, a color-determination unit for determining the color of a pixel of an original copy based on the image data, a magnification-changing unit, an image-quality correcting unit, and so forth.

[0078] In the image signal processing unit 20, an image signal input from the photoelectric transducers 16 and 17 is quantized to a 8-bit image data for each pixel, is subjected to various kinds of processing, and is output as image data D2. In addition, 1-bit color data DC indicating whether the color is a specified particular color or not is output, corresponding to the respective pixels of the image data D2.

[0079] Hereinafter, the memory unit 30 will be described

below. Fig. 10 is a block diagram showing the memory unit 30. The memory unit 30 comprises the image-changing portion 301, a binarization unit 302 for preparing binary data based on parameters set by the CPU 106, the image memory 304 having multi-ports, a code processing portion 305 having a compressor 311 and an expander 312 which can operate independently of each other, the code memory 306 having multi-ports, a rotation processing portion 307, a multivaluing portion 308 for preparing multivalued data based on parameters set by the CPU 106, the CPU 106 for controlling the whole of the above-described portions, and so forth.

[0080] The connection state in the image-changing portion 301 is changed based on a control signal, and thereby, an image data flow is controlled. It is determined by the image-changing portion 301 whether the image data D2 to be input to the memory unit 30 is supplied to the image memory 304 or not. If it is not required to store the image data in the memory, the image data D2 and the color data DC2 are directly output as image data D3 and color data DC 3, respectively.

[0081] In the case in which an image in the memory is displayed on the manipulation panel OP, the image data read from the image memory 304 is switched to the image data D4 (and the color data DC4) side and is output. This is

carried out, provided that this is required from a manipulation panel 130. In the normal copy operation, the image data is switched to the image data D3 (and the color data DC3) side, and is output.

[0082] The binarization unit 302 converts the multivalued image data D2 to binary image data in a restorable form. For example, the unit 302 converts the image data D2 to binary pattern data by the dither method, so that the whole data-amount is reduced. Contrary to the binarization portion 302, the multivaluing portion 308 infers to the multivalues to be restored based on the arrangement of the dots of the binary data, and restores the binary data to the original image data.

[0083] In the case in which the image data D4 is output to the manipulation panel 130, the image data D4 may be in the form of the binary data. Thus, the binary data as it is passes the multivaluing portion 308. Thus, the binary data is not processed in the multivaluing portion 308.

[0084] Fig. 11 is a block diagram showing the image-changing portion 301 of the memory unit 30. As shown in Fig. 11(a), the image-changing portion 301 comprises six bus gates 321 to 326, in which the ON (connection) and the OFF (cut-off) of the respective bus gates are controlled with the aid of control signals G1 to G6. As shown in Fig. 11(b), the respective control signals SG1 to SG6 become active or

non-active, depending on the operation modes. The connection states in the image-changing portion 301 are set by combining the active states with the non-active states. Thus, the image data flow is controlled.

[0085] When the image data D2 is written in image memory 304, the code processing portion 305 reads the data, compresses it, forms code data, and writes the data into the code memory 306. By an instruction by the CPU 106, the code data written in the code memory 306 is read therefrom, and is expanded to form the image data, which is written in the image memory 304.

[0086] When one page of the image date in the image memory 304 is formed in the image memory 304 by the expansion, the page is read, and rotation-processed in the rotation processing portion 307, if necessary. The multivalued image data is formed in the multivaluing portion 308, and is output as the image data D3. The compressor 311 and the expander 312 can operate in parallel, independently of each other. Data can be DMA transferred via DMAC (not shown) between the compressor 311, the expander 312, and the code memory 306.

[0087] The code memory 306 is controlled according to the control table MT1 stored in RAM 126. Fig. 12 illustrates the relations between the control table MT1 and the code memory 306.

[0088] The code memory 306 is sectioned into memory regions each composed of 32 Kbytes as a unit. Code data are stored in the respective regions, considering that the simultaneous control of writing (at reading) and reading (at printing) can be enabled.

[0089] The numbers representing the regions in the code memory 306, the numbers representing address regions stored in the non-compression state, the numbers of texts, the numbers of pages, attributes, the compression state, and different types of optional information required for the compression and expansion such as a compression system, a data length, and so forth. Thus, read image data can be controlled for each page as a unit.

[0090] Thus, the image of original copy is stored or read by use of the memory unit 30. Thus, an original copy can be copied again without the original copy being read again.

[0091] Fig. 13 is a block diagram of a manipulation panel 130. As regards the image data D4 and the color data DC4 output from the memory unit 30, data is culled therefrom so that the data D4 and DC4 can be easily displayed in the liquid crystal touch panel 91, and the display position is adjusted. This is performed in a display-adjustment portion 131. Then, the data are written in a display memory 132. In this case, the data of the image data D4 is DMA transferred not via the CPU 101.

[0092] Moreover, the graphics and characters of operation buttons or the like to be displayed on the liquid crystal touch panel 91 are written in the display memory 132 under control of the CPU 101. The contents written in the display memory 132 are transferred to the liquid crystal touch panel 91 via the I/O ports.

[0093] The CPU 101 periodically scans the input from the different keys 92 to 99 and the liquid crystal touch panel 91 via the I/O ports, and sets the states as internal parameters.

[0094] Fig. 14 is a block diagram of the printing unit 40. The printing unit 40 comprises a color separation selector 401 for changing where the image data D3 is to be output based on the color data DC, two buffers 411 and 412, a delay memory 421, and LD drivers 431 and 432 for driving the semiconductor lasers 61 and 62.

[0095] In the case in which the image data D3 input from the memory unit 30 corresponds to the second color (red color), the image data D3 is transferred from the color separation selector 401 to the LD driver 431 via the buffer 411. The drive of the semiconductor lasers 61 and 62 is controlled based on the data D3. On the other hand, in the case in which the image data D3 corresponds to the first color (black color), the image data D3 is transferred to the LD driver 432 via the buffer 411 and the delay memory 421,

due to the delay which corresponds to the difference between the exposure positions on the photoconducting drum 71, as described above. The drive of the semiconductor laser 62 is controlled based on the data D3.

[0096] Subsequently, the overall operation sequence of the copying machine 1, employed when the copying operation (printing operation) is carried out, will be briefly explained mainly in reference to commands (Q) requested by the CPUs 101 to 106, and transmitted or received between them, reports (A), and the flow of data.

[0097] The direct mode in which the image data of a read original copy as it is output to the printer PRT, and is copied there, and also, the memory mode in which image data is stored in the memory, is read, and then, is copied, will be described, below. The text insertion mode and the text replacement mode are carried out by changing the direct mode and the memory mode to each other at selected timing.

[0098] Fig. 18 illustrates the operation sequence used in the direct mode. In the direct mode, image data from the reader IR is directly printed by the printer PRT.

[0099] When the start key 96 is pushed, a start request is output from the CPU 101 to the CPU 105. From the CPU 105 when it receives the start request, read--request is output to the CPU 102, and a print request is output to the CPU 104, respectively. Then, a paper-sheet feeding report is output

from the CPU 104 to the CPU 105.

[0100] The operation of the reader IR is adapted to that of the reader IR. Accordingly, the practical read-timing of the scanner 19 is set to be later than the time when an exposure preparation completion signal is output from the CPU 104 to the CPU 102, the signal representing a paper sheet has reached a predetermined position in the image-forming system 70 and is in the printable state.

[0101] When the exposure preparation signal is output, a scan request is output from the CPU 102 to the CPU 103. Thereby, the scanning is started. When the scanner reaches the image area of an original copy, the read data (image data) is output to the printer PRT according to the image processing mode (e.g., magnification-changing, γ correction, image-quality correction, and so forth), and is printed on the paper-sheet.

[0102] After the scanning and reading of the original copy is completed, a scan completion report is output from the CPU 103 to the CPU 102. A read-completion report is output from CPU 102 to CPU 105. Moreover, an eject completion report is output from the CPU 104 to the CPU 105.

[0103] Fig. 19 illustrates the operation sequence of the write-operation in the memory mode. As described above, in the memory mode write-operation, image data is transferred from the reader IR to the image memory 304. First, a memory

preparation request is output from the CPU 105 controlling the overall sequence to the CPU 106. The CPU 106, receiving the request, sets for the internal hardware the connection state of the image-changing portion 301 for transferring the image data D2 from the image signal processing unit 20 to the image memory 304, the mode of the binarization (e.g., an error dispersion method, a threshold for set aside the background, a threshold for binarization, and so forth), start-addresses for write regions in the image memory 304, XY length information, and so forth.

[0104] After the setting and the preparation are completed, a memory preparation completion report is output from the CPU 106 to the CPU 105. When the CPU 105 receives the report, a read request is output from the CPU 105 to the CPUs 106 and 102. Moreover, a scan request is output from the CPU 102 to the CPU 103. Thereby, the scan is started.

[0105] When the image area of an original copy begins to be scanned, the read mode (image data D2) is output to the memory unit 30 according to the image processing mode set by the CPU 102.

[0106] After the reading by the scan is completed, read-completion reports are output from the CPUs 106 and 102 to the CPU 105, respectively. Thereafter, a compression request is output from the CPU 105 to the CPU 106. The CPU 106, receiving the request, sets read addresses in the image

memory 304, XY length information, write addresses in the code memory 306, the mode of the compressor 311 (e.g., the MH system), and so forth, and activates them. Thus, the compression is carried out, and the code data is stored in the code memory 306.

[0107] After the compression is completed, a compression completion request is output from the CPU 106 to the CPU 105. Fig. 20 illustrates the operation sequence of the memory mode read operation.

[0108] As described above, in the memory mode read operation, image dates is read from the image memory 304, output to the printer PRT, and printed there. First, an expansion request is output from the CPU 105 to the CPU 106. The CPU 106, receiving the request, sets read-addresses from the code memory 306, data amounts, write-addresses into the image data 304, XY-length information, the mode of the expander 312 (e.g., the MH method), and so forth, and activates them. Thereby, the expansion is carried out, and the image data is written in the image memory 304.

[0109] After the expansion is completed, an expansion report is output from the CPU 106 to the CPU 105. Subsequently, an memory preparation request for reading the image data from the image memory 304 is output from the CPU 105 to the CPU 106. The CPU 106, receiving the request, sets for the internal hardware the connection state of the

image-changing portion 301 for outputting the image data D3 from the image memory 304 to the printing unit 40, the rotation processing, the start-addresses of read regions in the image memory 304, XY length information, and so forth.

[0110] After the setting is finished, and thus, the preparation is completed, a memory preparation completion report is output from the CPU 106 to the CPU 105. When the CPU 105 receives the report, a print request is output from the CPU 105 to the CPUs 106 and 104. Moreover, a paper-sheet feeding report for informing the conveying state of paper-sheets is output from the CPU 104 to the CPU 105. Thereafter, the image data D3 read from the image memory 304 is output to the printer PRT and printed there.

[0111] After the printing is completed, a print-completion report and an eject-completion report are output from the CPUs 106 and 104 to the CPU 105. The CPU 105, receiving the reports, outputs a memory clear request for the CPU 106 in relation to the operation mode, and so forth.

[0112] Hereinafter, the operation of the copying machine 1 will be described with reference to the flow charts. As regards the sequence of the explanation, main routines for the execution by the CPU 101 to 108, and then, sub-routines executed in the respective main routines will be described. In some cases, different states used in the respective sub-routines are simply referred to as "state".

[0113] Fig. 21 is a flow chart of the main routine of the CPU 101. After the initial setting is carried out (step #11), an internal timer is started, and the time-period of the routine is monitored so as to become constant (step #12 and #16). Input control and display control are made for the manipulation panel OP (step #13 and #14), and other processing is carried out (step #15). Moreover, by interruption, the CPU 101 makes communication with the other CPUs 102 to 108.

[0114] Fig. 22 is a flow chart of the main routine of the CPU 102. After image data is input (step #23), positioning for making equal the time differences (step #24), which occur by a positional slippage between the photoelectric transducers 16 and 17, color-determination, image-processing, the output of image data, and so forth are carried out (step #25 and #28).

[0115] Fig. 23 is a flowchart of the main routine of CPU 103. CPU 103 controls the scanning system 10, and carries out the scan-control (step #33). CPU 103 counts the number of scanned pages whenever one page is scanned (steps #34, 35).

[0116] Moreover, in case in which motor pulse interruption occurs due to a motor pulse generated synchronously with the rotation of the scan motor M2, the interruption time interval of the motor pulse is measured (step #37), the

conduction to the motor is switched on or off (step #38), and the number of motor pulses (step #39) is counted, and so forth.

[0117] Fig. 24 is a flow chart of the main routine of the CPU 104. The CPU 104 controls the printer PRT. The CPU 104 controls the developing transfer system 70A (step #43), the conveying system 70B (step #44), the fixing system 70C (step #45), and the printing unit 40 (step #46), determines whether the copying is completed or not to check the number of copied pages (step #47 and #48), and makes other processing (step #49).

[0118] In the control at step #44, the size-detection sensors SE11 and 12 detects the sheet-size, and the CPU 104 arithmetically operates the paper-sheet re-feeding path length, the interval between paper-sheets, and the sheet-size. Based on the arithmetic operation results, the number M of paper-sheets which can be stacked on the paper-sheet re-feeding path is determined. It is to be noted that the number of paper-sheets on the paper-sheet feeding path can be calculated from the detected sheet-size, since the paper-sheet re-feeding path length and the interval between paper-sheets are constant.

[0119] Fig. 25 is a flow chart of the main routine of the CPU 105. The CPU 105 sets commands to activate and terminate the other CPUs and the operation mode. Thus, the

CPU 105 controls the overall operation of the copying machine 1. Thus, the CPU 105 carries out the mode/command setting (step #54) by which an activation command, magnification mode data, or the like is newly set, e.g., in the case in which data input via interrupt-communication is checked, the contents are analyzed (step #53), and further, any device must be operated or the magnification has been changed, depending on the contents. To output the data via communication, the data is set in the output area (step #55).

[0120] Fig. 26 is a flow chart of the main routine of the CPU 106. The CPU 106 controls the memory unit 30. Thus, the CPU 106 carries out the reception of a command (step #62), the transmission of a status (step #63), the control of writing in the image memory 304 (step #64), the control of compression (step #65), the control of expansion (step #66), the control of reading from the image memory 304 (step #67), erasing an unnecessary image (step #68), and the registration of data (step #69).

[0121] Fig. 27 is a flow chart of the main routine of the CPU 107. The CPU 107 controls the original copy conveying unit 500. Thus, the CPU 107 carries out an original copy feeding processing (step #73) of handling an original copy to correct any slippage, and thereby, controlling the conveying the original copy to the conveyer belt 506, an original copy conveying processing (step #74) of controlling

the setting of the original copy at a predetermined read position and the conveying thereof to the reverse roller 507 by means of the conveyer belt 506, and an original copy reverse and discharge processing (step #75) of controlling the discharge of the original copy which has reached the reverse roller 507, the re-conveying thereof toward the conveyer belt 506, and so forth.

[0122] Fig. 28 is a flow chart of the main routine of the CPU 108. The CPU 108 controls the paper re-feeding unit 600. Thus, the CPU 108 carries out an accommodation and discharge processing (step #83) of accommodating a printed paper-sheet discharged from the image-forming system 70 in order to print the back side of the paper-sheet or discharging the printed paper-sheet as it is into the paper-sheet discharge tray 621, and a reverse processing of reversing the accommodated paper-sheet (step #84).

[0123] In the accommodation and discharge processing, the discharge sensor SE62 disposed at the discharge port of the image-forming system 70 detects whether a paper-sheet is discharged from the image-forming system 70 or not. The conveyer roller 602 is rotated while the paper-sheet is being discharged. The conveyer roller 602 is stopped a predetermined time-period after the discharge.

[0124] In the reverse processing, the reverse roller 603 is normally rotated while the reverse sensor SE61 detects the

paper-sheet, and is rotated in the reverse direction when the reverse sensor SE61 becomes off. After a predetermined time-period, the reverse roller 603 is stopped.

[0125] Fig. 29 is a flowchart of the input control processing at step #13. Data input from the operation ten keys 92 to 99 on the manipulation panel OP or the buttons 98 on the liquid crystal touch panel 91 is read (step #101).

[0126] If the text insertion button 98a is pushed, the text insertion mode is set at "1" (steps #102 and #103). If the text replacement button 98b is pushed, the text replacement mode is set at "1" (steps #104 and #105). If the original copy replacement button 98c is pushed, the original copy replacement mode is set at "1", provided that image data to be replaced exists in the memory (steps #106 to #108). If the original copy replacement button 98c is pushed, the original copy replacement mode is set at "1". If the store key 99 is pushed, the store mode is set at "1" (steps #109 and #110).

[0127] If these modes are changed to other modes, or if a numerical value or the like as a parameter is changed, the internal parameter is changed similarly to the above-described examples (steps #111 and #112). The contents specified by the different buttons 98, described with reference to Figs. 2 to 7, are retained in the form of the parameters.

[0128] If the internal parameters are changed due to the above-described processing, this is posted to the CPU 105 via the serial I/O (step #114). Fig. 30 is a flowchart of the mode/command setting at step #54.

[0129] If the text insertion button mode is instructed via the manipulation panel OP, the text insertion is carried out (steps #201 and #202). If the text replacement mode is instructed, the text replacement mode is carried out (steps #203 and #204). If the original copy replacement mode is instructed, the original copy replacement is carried out (steps #205 and #206). If the store mode is instructed, the storing is carried out (steps #207 and #208). Moreover, if a magnification is set, the copy mode is instructed, the processing is carried out (step #209).

[0130] Fig. 31 is a flowchart of the text insertion processing at step #202. First, the text insertion state representing the present processing state is checked (step #501). At first, the state is "0". Thus, the insertion page position selected via the manipulation panel OP and the image data (image to be inserted) of the insertion original copy in the memory are checked. The state is set at "1" (steps #502 to #504).

[0131] While the state is "1", the instruction to start the copy is awaited. When the copy starts, the state is set at "2" (steps #505 and #506). When the copy starts, it is

confirmed which page is copied at present, based on information posted from the CPUs 103, 104, 107, 108, and so forth (step #507). In the case in which the last page has not been copied yet (No at step #509), the direct mode or the memory mode is selectively set, based on the page checked at step #502 and #503.

[0132] In particular, in the case in which the position of the page which is being copied is on the back side of the insertion page position (Yes at step #510), the copy operation is being carried out with reading from the memory (Yes at step #511), and all of the insertion images nave not been output yet (No at step #512), the image-changing portion 301 is changed, so that the copy is carried out by the memory mode reading operation (step #515).

[0133] Moreover, in the case in which the position of the page is on the front side of the insertion page position (No at step #510), or all of the insertion images have been output (Yes at step #512), the copy is carried out by the direct mode (step #514). It is to be noted that the reading of an original copy is interrupted during the copy by the memory mode. When the mode is changed to the direct mode, the reading of an original copy is started again.

[0134] When all of the copy is completed (Yes at step #509), the state and the text insertion mode are set at "0" (steps #516 and #517). Fig. 32 is a flowchart of the text

replacement processing at step #204.

[0135] First, the text replacement state representing the present processing state is checked (step #521). At first, the state is "0". Thus, the replacement page position selected via the manipulation panel OP is checked. The state is set at "1" (steps #522 and #523).

[0136] While the state is "1", the instruction to start the copy is awaited. When the copy starts, the state is set at "2" (steps #524 and #525). When the copy starts, it is confirmed which page is copied at present (step #526). In the case in which the last page has not been copied yet (No at step #527), it is checked whether the position of the page to be copied subsequently is the replacement page position (step #528) or not. If so, the direct mode is set (step #529). If not, the memory mode is set (step #530).

[0137] When all of the copy is completed (Yes at step #527), the state and the text replacement mode are set at "0" (steps #531 and #532). Fig. 33 is a flowchart of the original copy replacement processing at step #206.

[0138] First, the original copy replacement state representing the present processing state is checked (step #541). At first, the state is "0". Thus, the memory unit 30 is instructed to erase image data of the page selected via the manipulation panel OP (step #542). The state is set at "1" (step #543).

[0139] While the state is "1", it is checked whether the erase instructed at step #542 is completed or not (step #544). If it is completed, the CPU 103 for controlling the scanning system 10 instructed so that an original copy is scanned and read (step #545), and the state is set at "2" (step #546).

[0140] It is checked whether the original copy reading is completed or not (step #547). If the reading is completed, the store in the control table MT1 is instructed (step #548). If the store is completed (Yes at step #550), the state and the original copy replacement mode are set at "0" (steps #551 and #552). In the above case, the memory unit 30 is instructed on all of the operation.

[0141] Fig. 34 is a flowchart of the store processing at step #208. The initialization (step #561), command reception (step #562), status transmission (step #563), memory write control (step #564), and compression control (step #565) are made.

[0142] Fig. 35 is a flowchart of the command reception processing at step #62. In the case in which the command reception occurs (Yes at step #301), the write state of the image memory 304 is set at "1" (steps #302 and #303), when the command is a read command. The compression state is set at "1" (steps #304 and #305), when the command is a compression command. The expansion state is set at "1"

(steps #306 and #307), when the command is an expansion command. The read state is set at "1" (steps #308 and #309), when the command is a print command. The erase state is set at "1" (steps #310 and #311), when the command is an erase command. The record state is set at "1" (steps #312 and #313), when the command is a record command.

[0143] Fig. 36 is a flowchart of the status transmission processing at step #63. If a transmission status exists, the status is transmitted (steps # 321 and #322).

[0144] Fig. 37 is a flowchart of the image memory write control processing at step #64. While the state is "1", the start address for writing in the image memory 304, XY-length information, image-processing parameters, and so forth are set (step #332), the memory preparation-completion status or the like is set (step #333) is set, and the state is set at "2" (step #334).

[0145] In the state of "2", when the writing in the image memory 304 is completed (Yes at step #335), the read-completion status is set (step #336), and the state is set at "0" (step #337).

[0146] Fig. 38 is a flowchart of the compression control processing at step #65. While the state is "1", an address for reading from the image memory 304, XY-length information, an address for writing in the code memory 306, and a compression method are set for the compression processing.

Thus, the contents of the control table MT1 are changed, and the compression is started (step #352). The state is set at "2" (step #353).

[0147] In the state of "2", the setting is carried out every time the compression of one memory region sectioned in a 32 Kbytes unit is completed (step #358). When the compression of one page is completed, the compression-completion status is set (step #356), and the state is set at "0" (step #357).

[0148] Fig. 39 is a flowchart of the compression control processing at step #66. In the state of "1", it is determined whether the selected page has been compressed or not (step #372) or not. If Yes, the setting of the memory unit 30 is carried out, and the expansion is started (step #373), and the state is set at "2" (step #374).

[0149] If No at step #372, the expansion error status is set (step #375), and the state is set at "0" (step #376). In the state of "2", when the expansion is completed, the expansion-completion status is set (steps #377 and #378), and the state is set at "0" (step #379).

[0150] Fig. 40 is a flowchart of the image memory read control processing at step #67. In the state of "1", a start address for reading in the image memory 304, a data amount, and other parameters are set. The reading is started (step #392). The state is set at "2" (step #393).

[0151] In the state of "2", when the reading from the image memory 304 is finished (step #394, YES), the print-completion status is set (step #395), and the state is set at "2".

[0152] Fig. 41 is a flowchart of the erasing processing at step #68. in the state of "1", an erase start address, a data amount, and other parameters are set, so that the image data stored in the image memory 304 and the code memory 306 is erased. Thus, the erase processing is started (step #401). The state is set at "2" (step #402).

[0153] In the state of "2", it is checked whether the image data has been erased or not (step #403). In the case in which the image data has been erased, the erase-completion status for representing this is set (step #404). The record is erased from the control table MT1 (step #405), and the state is set at "0" (step #406).

[0154] Fig. 42 is a flowchart of recording processing at step #69. In the state of "1", it is checked whether the image data exists or not (step #410). If the imaged data exists, the address in which the image data exists or the like is set in the page selected by the control table MT1 (step #411), and the state is set at "0" (step #412).

[0155] In the copying machine 1 according to the above-described embodiment, a commonly used original copy is read in the memory by the store mode in advance. A not-commonly-

used original copy is read by the text insertion mode or the text replacement mode. Thereby, the whole of the original copies or the original copy set can be copied. Therefore, the commonly used original copy may be read only one time. Accordingly, the time and the labor required for the copy can be considerably reduced.

[0156] In addition, the commonly-used original copy and the not-commonly-used original copy are copied in the target sequence, and discharged onto the paper-sheet discharge tray 621. Therefore, advantageously, it is unnecessary to re-arrange the paper-sheets or insert the paper-sheet after the copying. Moreover, it is unnecessary to ensure the working place.

[0157] In the case in which the image data of the read original copy is retained in the memory, the commonly-used original copy is prevented from being doubly stored. Thus, the memory can be effectively used.

[0158] In particular, in the case in which the commonly-used original copy is positioned in the middle of all of the original copies, or the number of pages of the commonly-used original copy is small compared with that of pages of all of the original copies, the insertion page position of the not-commonly-used original copy and the number of pages can be set easily and correctly.

[0159] Moreover, in the text replacement mode, the

replacement page position and the number of pages can be set easily and correctly, in the case in which the number of pages of a commonly used original copy is small compared with that of the overall original copy, or original copy sets are partially different from each other.

[0160] By the original copy replacement mode, a part of the memory original copy can be easily replaced by the other original copy. Thus, if there is an error in a part of an original copy stored in the memory, or if an error happens when an original copy is read, it is unnecessary to read all of the original copy again. It is sufficient to read only the original copy in which such an error happens. Moreover, by combination of the original copy replacement mode with another mode, different types of data in which some parts are similar to each other, but the other parts are different from each other can be easily prepared, as in the case in which a partially commonly-used original copy exists in the data, or a revised edition of an original copy previously used is copied.

[0161] In the above-described embodiment, in the case of the store mode, all of the original copies of an original copy set are set on the original copy feeding tray 510, the page of a commonly-used original copy of a not-commonly-used original copy can be selected via the liquid crystal panel 91, and only the commonly-used original copy may be

automatically read and stored in the memory original copy.

[0162] In the above-described embodiment, plural memory chips may be used for the image memory 304 and the code memory 306 provided in the memory unit 30, or one memory chip may be sectioned for this purpose.

[0163] In the above-described embodiment, the scanner 19 is moved to read an original copy. The original copy, when it is moved, may be read by means of the scanner 19. The original copies may be set on the original copy glass 18 manually and sequentially and read without the use of the original copy conveying unit 500.

[0164] In the above-described embodiment, a plurality of texts are stored in the memory. However, one text may be stored. In this case, the above-described selection of the text is unnecessary. In addition, the circuit configurations of the control unit 100 containing the memory unit 30 and so forth, the processing contents of the respective CPUs 101 to 108, the processing share, the software configurations, and the structures of the respective parts of the copying machine 1, and so forth may be variously modified without departing from the sprit and scope of the present invention.

[0165]

[Advantages] According to the present invention, in the case in which plural original copy sets each containing a

commonly-used original copy are copied, it is unnecessary to read the commonly-used original copy. In addition, it is unnecessary to re-arrange or insert the copied paper-sheets after the copy-operation.

[0166] According to Claim 2 of the present invention, in the case in which a commonly-used original copy positions in the middle of an overall original copy, or in which the number of pages of the commonly-used original copy is small as compared with that of the overall original copy, the insertion page position and the number of pages of the commonly-used original copy can be set easily and correctly.

[0167] According to Claim 3 of the present invention, in the case in which the number of pages of a commonly-used original copy is small as compared with that of an overall original copy, or in which original copy sets are different from each other in the parts thereof, the replacement page position and the number of pages of the not-commonly-used original copy can be set easily and correctly.

[0168] According to Claim 4 of the present invention, in the case in which a part of a original copy stored in the memory has an error, or in which an error occurs when an original copy is read, it is sufficient to read only the part of the original copy having the error again. Thus, the time and the labor can be saved.

[Brief Description of the Drawing]

[Fig. 1] Fig. 1 is a cross-sectional front view of the overall constitution of a copying machine according to the present invention.

[Fig. 2] Fig. 2 is a front view of a manipulation panel.

[Fig. 3] Fig. 3 illustrates a screen which appears on a liquid crystal touch panel in a text insertion mode.

[Fig. 4] Fig. 4 illustrates a screen which appears on the liquid crystal touch panel in the text insertion mode.

[Fig. 5] Fig. 5 illustrates a screen which appears on the liquid crystal touch panel in a text replacement mode.

[Fig. 6] Fig. 6 illustrates a screen which appears on the liquid crystal touch panel in the text replacement mode.

[Fig. 7] Fig. 7 illustrates a screen which appears on the liquid crystal touch panel in an original copy replacement mode.

[Fig. 8] Fig. 8 is a block diagram showing the configuration of a control unit of the copying machine.

[Fig. 9] Fig. 9 is a block diagram showing the configuration of a control unit of the copying machine.

[Fig. 10] Fig. 10 is a block diagram of a memory unit.

[Fig. 11] Fig. 11 is a block diagram of the image-changing portion of the memory unit.

[Fig. 12] Fig. 12 illustrates the relation between a control table and a code memory.

[Fig. 13] Fig. 13 is a block diagram of a manipulation

panel.

[Fig. 14] Fig. 14 is a block diagram of a printing-processing unit.

[Fig. 15] Fig. 15 illustrates the operation of a text insertion mode.

[Fig. 16] Fig. 16 illustrates the operation of a test replacement mode.

[Fig. 17] Fig. 17 illustrates the operation of an original copy replacement mode.

[Fig. 18] Fig. 18 illustrates the operation sequence of a direct mode.

[Fig. 19] Fig. 19 illustrates the operation sequence of memory mode write operation.

[Fig. 20] Fig. 20 illustrates the operation sequence of memory mode read operation.

[Fig. 21] Fig. 21 is a flowchart of the main routine of CPU 101.

[Fig. 22] Fig. 22 is a flowchart of the main routine of CPU 102.

[Fig. 23] Fig. 23 is a flowchart of the main routine of CPU 103.

[Fig. 24] Fig. 24 is a flowchart of the main routine of CPU 104.

[Fig. 25] Fig. 25 is a flowchart of the main routine of CPU 105.

[Fig. 26] Fig. 26 is a flowchart of the main routine of CPU 106.

[Fig. 27] Fig. 27 is a flowchart of the main routine of CPU 107.

[Fig. 28] Fig. 28 is a flowchart of the main routine of CPU 108.

[Fig. 29] Fig. 29 is a flowchart of input controlling.

[Fig. 30] Fig. 30 is a flowchart of mode/command setting-up.

[Fig. 31] Fig. 31 is a flowchart of text insertion processing.

[Fig. 32] Fig. 32 is a flowchart of text replacement processing.

[Fig. 33] Fig. 33 is a flowchart of original copy replacement processing.

[Fig. 34] Fig. 34 is a flowchart of store processing.

[Fig. 35] Fig. 35 is a flowchart of command reception processing.

[Fig. 36] Fig. 36 is a flowchart of status transmission processing.

[Fig. 37] Fig. 37 is a flowchart of image memory write controlling.

[Fig. 38] Fig. 38 is a flowchart of compression controlling.

[Fig. 39] Fig. 39 is a flowchart of expansion controlling.

[Fig. 40] Fig. 40 is a flowchart of erasing.

[Fig. 41] Fig. 29 is a flowchart of entering-processing.

[Reference Numeral]

1: copying machine (image-forming apparatus)1

98a: text insertion button (memory original copy selection means, original copy sequence setting means)

98a3: preceding text button (memory original copy selection means)

98a4: following text button (memory original copy selection means)

98a5: preceding page button (memory original copy selection means)

98a6: following page button (memory original copy selection means)

98a10: page-changing button (original copy selection means)

98a11: page-changing button (original copy selection means)

98b: text replacement button (memory original copy selection means, original copy sequence setting means)

98b3; preceding text button (memory original copy selection means)

98b4; following text button (memory original copy selection means)

98b10; cursor button (memory original copy selection means, original copy sequence setting means)

98b11; cursor button (memory original copy selection means, original copy sequence setting means)

100; control unit (memory original copy selection means,

original copy sequence setting means, output changing means, original copy replacement means)

301; image changing portion (output changing portion)

304; image memory (image storage portion)

306; code memory (image storage portion)

IR; reader (image reading portion)

PRT; printer device (printer)

HG2; screen (insertion mode display screen)

HG4, HG5; screen (replacement mode display screen)

Fig. 2 91) COPY IN A SORT·STAPLE MODE IS READY. 99 SHEETS 1) AUTO 2) EQUI-MAGNIFICATION 3) AUTO 4) DENSITY 5) MAGNIFICATION 6) SHEET 98a) TEXT INSERTION 98b) TEXT REPLACEMENT 98c) ORIGINAL COPY REPLACEMENT 97a) ONE SIDE - ONE SIDE 97b) BOTH SIDES - ONE SIDE 97c) ONE SIDE - BOTH SIDES 97d) BOTH SIDES - BOTH SIDES 99) STORE MODE

Fig. 36 1) TRANSMIT STATUS #321) TRANSMISSION STATUS EXIST? #322) TRANSMIT 2) RETURN

Fig. 1 1) COPYING MACHINE

Fig. 4 1) [TEXT INSERTION MODE] 2) THE FIRST PAGE TO THE THIRD PAGE OF TEXT 3 STORED IN MEMORY ARE INSERTED AFTER THE SECOND PAGE OF TO BE READ.
PUSH PRINT KEY.

Fig. 6 1) [TEXT REPLACEMENT MODE] 2) THE FIFTH PAGE OF TEXT 3 IS REPLACED. 3) PUSH PRINT KEY.

Fig. 20 MEMORY MODE READING-OPERATION 1) EXPANSION Q 2) EXPANSION-COMPLETION A 3) EXPANSION-PROCESSING 4) MEMORY PREPARATION Q 5) MEMORY PREPARATION COMPLETION A 6) PRINT Q 7) PRINT Q 8) PAPER-FEED A 9) IMAGE DATA 10) PRINT-COMPLETION A 11) PRINT-COMPLETION A 12) EJECT A

Fig. 3(a) 1) [TEXT INSERTION MODE] TEXT 3 PAGE 1 2) LET ME GET STRAIGHT TO THE POINT. THIS PROPOSAL, IN OUR COMPANY AT PRESENT ··· 3) THE START PAGE OF INSERTION TEXT? PUSH EXECUTION BUTTON, IF NECESSARY 98a1) EXECUTION 98a2) STOP 98a3) PRECEDING TEXT 98a4) FOLLOWING TEXT 98a5) PRECEDING PAGE 98a6) FOLLOWING PAGE

(b) 1) [TEXT INSERTION MODE] 2) THE FIRST PAGE TO THE THIRD PAGE OF TEXT 3 STORED IN MEMORY 3)
ARE INSERTED AFTER [ ] TH PAGE TO BE READ 98a7) EXECUTION 98a8) STOP 4) PUSH EXECUTION BUTTON, IF NECESSARY 98a9) SELECT IMAGE 98a10) PAGE CHANGE 98a11) PAGE CHANGE

Fig. 5(a) 1) [TXT INSERTION MODE] TEXT 3 PAGE 1 2) LET ME GET STRAIGHT TO THE POINT. THIS PROPOSAL, IN OUR COMPANY AT PRESENT ··· 3) THE START PAGE OF INSERTION TEXT? 98a1) EXECUTION 98a2) STOP 98a3) PRECEDING TEXT 98a4) FOLLOWING TEXT 98a5) PRECEDING PAGE 98a6) FOLLOWING PAGE

(b) 1) [TEXT INSERTION MODE] 2) [5] PAGE TO BE INSERTED 3) No. 1: TEXT 3 FIRST PAGE No. 2: TEXT 3 SECOND PAGE No. 3: TEXT 3 THIRD PAGE No. 4: TEXT 3 FOURTH PAGE No. 5: TEXT 3 FIFTH PAGE 4) PUSH EXECUTION BUTTON, IF NECESSARY 98b7) EXECUTION 98b8) STOP 5) CURSOR 98b9) CHECK IMAGE

Fig. 16 1) n PAGES (FIRST PAGE SECOND PAGE THIRD PAGE FOURTH PAGE FIRST PAGE SIXTH PAGE SEVENTH PAGE EIGHTH PAGE) 2) MEMORY ORIGINAL COPY (SELECTED ORIGINAL COPY) 3) READ ORIGINAL COPY g TH PAGE 4) MEMORY ORIGINAL COPY (SELECTED ORIGINAL COPY)

Fig. 7 1) [TEXT REPLACEMENT MODE] TEXT 3 PAGE 1 2) INFORMATION ON BOWLING TOURNAMENT 3) THE SCHEDULE OF BOWLING TOURNAMENT INFORMED YOU ON PREVIOUS DAY HAS BEEN DECIDED AS FOLLOWS: DATE: 2001 PLACE; COMMERCIAL AVENUE IN FRONT OF STATION ENTRANCE FEE: ABOUT 3000 YEN ARTICLE TO BE BROUGHT; BOWLING BALL 98c2) STOP 4) ORIGINAL COPY REPLACED? READING STARTS WHEN COPY KEY IS PUSHED 98c2) STOP 98c3) PRECEDING TEXT 98c4) FOLLOWING TEXT 98c5) PRECEDING PAGE 98c6) FOLLOWING PAGE

Fig. 9 1) SERIAL I/O 2) ORIGINAL COPY CONVEYING PORTION SENSOR INPUT 3) ORIGINAL COPY CONVEYING PORTION DRIVE CIRCUIT 4) RE-FEEDING PORTION SENSOR INPUT 5) RE-FEEDING PORTION SENSOR INPUT 6) ORIGINAL COPY CONVEYING 7) PAPER RE-FEEDING

Fig. 8 1) INAGE FORMING SENSOR 2) EACH PORTION OF IMAGE FORMING SYSTEM 100) control unit 130) manipulation panel

3) OPERATIONAL KEY 4) DISPLAY LED 5) LIQUID CRYSTAL TOUCH PANEL 30) memory unit 6) SCANNER MOTOR 7) EXPOSURE LAMP 103) READ-SCANNING 102) IMAGE PROCESSING 10) SERIAL I/O 20) IMAGE SIGNAL PROCESSING UNIT 105) TIMING ADJUSTMENT 40) PRINTING UNIT 104) IMAGE-FORMING SYSTEM CONTROL

Fig. 14 40) PRINTING UNIT 1) IMAGE DATA D3 2) COLOR DATA DC 411) BUFFER 1 (COLOR) 412) BUFFER 2 (BLACK) 421) DELAY MEMORY 431) LD DRIVER 432) LD DRIVER

Fig. 10 1) TO PRINT PROCESSING UNIT 2) TO OPERATION PANEL IMAGE DATA D2 COLOR DATA DC2 IMAGE DATA D3 COLOR DATA DC3 IMAGE DATA D4 COLOR DATA DC4 301) IMAGE-CHANGING PORTION 302) BINARIZATION PROCESSING PORTION 308) MULTIVALUING PORTION 307) ROTATION PROCESSING PORTION 304) IMAGE MEMORY 311) COMPRESSOR 3) CODE PROCESSING PORTION 312) EXPANDER 306) CODE MEMORY 30) MEMORY UNIT

Fig. 13 1) IMAGE DATA D4 2) COLOR DATA DC4 131) DISPLAY-ADJUSTMENT PORTION 132) DISPLAY MEMORY 130) MANIPULATION PANEL

Fig. 34 STORE-PROCESSING #561) INITIALIZE #562) RECEIVE COMMAND #563) TRANSMIT STATUS #564) IMAGE DATA WRITE CONTROL #565 COMPRESSION-CONTROL RETURN

Fig. 11(a) 301) IMAGE-CHANGE PORTION 1) TO BINARIZATION PORTION 2) MULTI-VALUATING PORTION

(b) 1) MODE 2) SIGNAL 3) MEMORY MODE 4) WRITE OPERATION 5) READ OPERATION 6) DIRECT MODE 7) DISPLAY MODE 8) A; ACTIVE MODE N; NON-ACTIVE MODE X; NOT DETERMINED

Fig. 12(a) 1) DATA NO. 2) COMPRESSION DATA REGION 3) NON-COMPRESSION DATA REGION 4) TEXT NO. 5) PAGE 6) ATTRIBUTES 7) COMPRESSION STATE 8) ADDITIONAL INFORMATION 9) BLACK 10) COLOR 11) BLACK 12) COLOR 13) BLACK 14) COLOR 15) COMPRESSION 16) COMPRESSION 17) COMPRESSION 18) COMPRESSION 19) EXPANSION 20) EXPANSION

(b) 306) CODE MEMORY 1) COMPRESSION DATA OF FIRST PAGE 2) COMPRESSION DATA OF FIRST PAGE 3) COMPRESSION DATA OF SECOND PAGE 4) COMPRESSION DATA OF SECOND PAGE

Fig. 15 1) j PAGES OF READ ORIGINAL COPY 2) k PAGES OF MEMORY ORIGINAL COPY (SELECTED ORIGINAL COPY) 3) m PAGES OF READ ORIGINAL COPY 4) FIRST PAGE 5) SECOND PAGE 6) FIRST PAGE 7) SECOND PAGE 8) THIRD PAGE 9) THIRD PAGE 10) FOURTH PAGE 11) FIFTH PAGE 12) n PAGES

Fig. 17 304) IMAGE MEMORY 1) SECOND PAGE (NEW) 306) CODE MEMORY 2) FIRST PAGE 3) (SECOND PAGE) 4) THIRD PAGE 5) FOURTH PAGE 6) SECOND PAGE (NEW) MT1) CONTROL TABLE 7) FIRST PAGE 8) SECOND PAGE 9) THIRD PAGE 10) FOURTH PAGE

Fig. 18 1) DIRECT MODE 2) START 3) READING Q 4) READING-COMPLETION 5) SCAN Q 6) READ DATA 7) SCAN-COMPLETION A 8) PRINT Q 9) PAPER-FEEDING A 10) EXPOSURE PREPARATION COMPLETION A 11) EJECT A

Fig. 19 1) MEMORY MODE WRITE OPERATION 2) MEMORY PREPARATION Q 3) MEMORY PREPARATION COMPLETION A 4) READING Q 5) READING-COMPLETION A 6) READING-COMPLETION A 7) COMPRESSION Q 8) COMPRESSION COMPLETION A 9) READING Q 10) READ DATA 11) COMPRESSION PROCESSING 12) SCAN A 13) SCAN-COMPLETION A

Fig. 26 1) START #61 INITIALIZATION #62 RECEIVE COMMAND #63 TRANSMIT STATUS #64 IMAGE MEMORY WRITE CONTROL #65 COMPRESSION CONTROL #66 EXPANSION CONTROL #67 IMAGE MEMORY READ CONTROL #68 ERASE-PROCESSING #69 ENTRY-PROCESSING #70 OTHER PROCESSING

Fig. 21 START #11 INITIAL-SET #12 START INTERNAL TIMER #13 INPUT CONTROL #14 DISPLAY CONTROL #15 OTHER CONTROL

#16 INTERNAL TIMER COMPLETED?

Fig. 22 START #21 INITIAL-SET #22 START INTERNAL TIMER #23 INPUT IMAGE DATA #24 POSITION #25 DETERMINE COLOR #26 IMAGE PROCESSING #27 OUTPUT IMAGE DATA #28 OTHER CONTROL #29 INTERNAL TIMER COMPLETED?

Fig. 23 START #31 INITIAL-SET #32 START INTERNAL TIMER #33 SCAN CONTROL #34 SCANNED? #35 CHECK NUMBER OF SCANNED PAGES #35 INTERNAL TIMER COMPLETED? 1) INTERRUPTION OF MOTOR PULSE #37 MEASURE INTERRUPTION TIME #38 DRIVE MOTOR #39 COUNT PULSE NUMBER 2) RETURN

Fig. 37 1) IMAGE MEMORY WRITE CONTROL 2) RETURN 3) STATE 0 4) STATE 1 5) STATE 2 #332 SET MEMORY UNIT #333 COMPLETION OF MEMORY PREPARATION, SET STATUS #334 STATE ← 2 #335 WRITE COMPLETED? #336 COMPLETION OF READING, SET STATUS #337 STATE ← 0

Fig. 24 START #41 INITIAL-SET #42 START INTERNAL TIMER #43 CONTROL DEVELOPMENT AND TRANSFER SYSTEM #44 CONTROL CONVEYING SYSTEM #45 CONTROL FIXING SYSTEM #46 CONTROL PRINT-PROCESSING #47 COPY END? #48 CHECK NUMBER OF COPIED PAGES #49 OTHER PROCESSING #50 INTERNAL TIMER COMPLETED?

Fig. 25 START #51 INITIAL-SET #52 START INTERNAL TIMER #53 ANALYZE INPUT DATA #54 SET MODE/COMMAND #55 SET OUTPUT DATA #56 OTHER PROCESSING #57 INTERNAL TIMER COMPLETED?

Fig. 27 START #71 INITIAL-SET #72 START INTERNAL TIMER #73 FEED ORIGINAL COPY #74 CONVEY ORIGINAL COPY #75 REVERSE AND DISCHARGE ORIGINAL COPY #76 INTERNAL TIMER COMPLETED?

Fig. 28 START #81 INITIAL-SET #82 START INTERNAL TIMER #83 ACCOMMODATE AND DISCHARGE #84 REVERSE #85 OTHER PROCESSING #86 INTERNAL TIMER COMPLETED?

Fig. 40 1) IMAGE MEMORY READ CONTROL 3) STATE 0 4) STATE 1 #392 SET MEMORY UNIT #393 STATE ← 2 5) STATE 2 #394 READ COMPLETED? #395 COMPLETE PRINT, SET STATUS #396 STATE ← 0 2) RETURN

Fig. 29 1) INPUT CONTROL #101 INPUT READ #102 TEXT INSERTION BUTTON PUSHED? #103 TEXT INSERTION MODE ← 1 #104 TEXT REPLACEMENT BUTTON PUSHED? #105 TEST INSERTION MODE ← 1 #106 ORIGINAL COPY REPLACEMENT BUTTON PUSHED? #107 DATE EXIST IN MEMORY #108 ORIGINAL COPY REPLACEMENT MODE ← 1 #109 STORE KEY PUSHED? #110 STORE MODE ← 1 #111

OTHER MODE PARAMETER CHANGED? #112 CHANGE INTERNAL PARAMETER #113 INTERNAL PARAMETER CHANGED? #114 TRANSMIT CHANGED CONTENTS TO OTHER CPU 2) RETURN

Fig. 42 1) ENTRY-PROCESSING #410 IMAGE EXIST? #411 ENTER IMAGE INSTRUCTED PAGE IN CONTROL TABLE #412 STATE ← 0 2) RETURN 3) STATE 0 4) STATE 1

Fig. 30 SET MODE/COMMAND #201 TEXT INSERTION MODE 1? #202 INSERT TEXT #203 TEXT REPLACEMENT MODE 1? #204 MAKE TEXT-REPLACEMENT #205 ORIGINAL COPY REPLACEMENT MODE ← 1? #206 MAKE ORIGINAL COPY REPLACEMENT #207 STORE-MODE 1? #208 STORE #209 OTHER PROCESSING RETURN

Fig. 31 1) TEXT INSERTION PROCESSING #501 TEXT INSERTION STATE? #502 CHECK INSERTION PAGE POSITION #503 CHECK INSERTION IMAGE #504 STATE ←1 #505 COPY START? #506 STATE ←2 #507 CHECK PRESENT OUTPUT PAGE #509 END? #510 AFTER INSERTION PAGE POSITION #511 IS MEMORY COPY BEING MADE? #512 ALL OF THE INSERTION IMAGES OUTPUT? #514 SET DIRECT MODE #515 SET MEMORY MODE #515 STATE ← 0 #517 INSERTION MODE ← 0 2) RETURN 3) STATE 0 4) STATE 1 5) STATE 2

Fig. 32 1) TEXT REPLACEMENT PROCESSING #521 TEXT

REPLACEMENT STATE? #522 CHECK REPLACEMENT PAGE POSITION #523 STATE ← 1 #524 COPY START? #525 STATE ← 2 #526 CHECK PRESENT OUTPUT PAGE #527 END? #528 REPLACEMENT POSITION PAGE? #529 SET DIRECT MODE #530 SET MEMORY MODE #531 STATE ← 0 #532 TEXT REPLACEMENT MODE ← 0 2) RETURN

Fig. 33 ORIGINAL COPY REPLACEMENT PROCESSING #541 ORIGINAL COPY REPLACEMENT STATE? #542 INSTRUCT DATA ERASE #543 STATE ← 1 #544 ERASE COMPLETED? #545 INSTRUCT ORIGINAL COPY READ #546 STATE ← 2 STATE 2 #547 ORIGINAL COPY READ COMPLETED? #548 INSTRUCT DATA ENTRY #549 STATE ← 3 #550 DATA ENTRY COMPLETED? #551 STATE ← 0 #552 ORIGINAL COPY REPLACEMENT MODE ← 0 RETURN

Fig. 35 COMMAND RECEPTION #301 COMMAND RECEPTION EXIST? #302 READ COMMAND? #303 WRITE STATE ← 1 #304 COMPRESSION COMMAND? #305 COMPRESSION STATE ← 1 #306 EXPANSION COMMAND? #307 EXPANSION STATE ← 1 #308 PRINT COMMAND? #309 ←READ STATE ← 1 #310 ERASE COMMAND? #311 ERASE STATE ← 1 #312 ENTRY COMMAND? #313 ENTRY STATE ← 1 #314 OTHER COMMAND? #315 CORRESPONDING PROCESSING RETURN

Fig. 38 1) COMPRESSION CONTROL 3) STATE 0 4) STATE 1 5) STATE 2 #352 SET MEMORY UNIT #353 STATE ← 2 #354 ONE-TIME COMPRESSION FINISHED? #356 SET COMPRESSION COMPLETION

STATUS #357 STATE ← 0 #358 SET MEMORY UNIT 2) RETURN

Fig. 39 1) EXPANSION CONTROL 3) STATE 0 4) STATE 1 5) STATE 2 #372 SELECTED PAGE COMPRESSED #373 SET MEMORY UNIT #374 STATE ← 2 #377 EXPANSION FINISHED? #378 SET EXPANSION COMPLETION STATUS #379 STATE ← 0 #375 SET EXPANSION ERROR STATUS #376 STATE ← 0 2) RETURN

Fig. 41 1) ERASE PROCESSING 3) STATE 0 4) STATE 1 5) STATE 2 #401 SET MEMORY UNIT #402 STATE ← 2 #403 ERASE COMPLETED? #404 SET ERASE COMPLETION STATUS #405 ERASE THE CONTENTS OF CONTROL TABLE #406 STATE ← 0 2) RETURN